

SAMPLING AND ANALYSIS REPORT

GULFPORT TURNING BASIN

Prepared for

Mississippi State Port Authority at Gulfport

U.S. Army Corps of Engineers

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
µg/kg	micrograms per kilogram
ASTM	American Society for Testing and Materials
BP	bioaccumulation potential
COC	chain-of-custody
Ctox	Continuous Trap Oxidizer
CY	cubic yard
DU	dredge units
EC ₅₀	median effective concentration
ERL	effects range low
ERM	effects range median
FDA	U.S. Food and Drug Administration
GPS	global positioning system
HDPE	high-density polyethylene
LC ₅₀	median lethal concentration
LCS	laboratory control samples
LCSD	laboratory control sample duplicates
LDPE	low-density polyethylene
LPAH	low molecular weight polycyclic aromatic hydrocarbons
LPC	limiting permissible concentration
MDL	method detection limit
mL	milliliter
MLLW	mean lower low water
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicates
MSPA	Mississippi State Port Authority
NAD83	North American Datum 1983

ODMDS	Ocean Dredged Material Disposal Sites
ORO	oil range organics
OTM	Ocean Disposal – Testing Manual
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
QA/QC	quality assurance/quality control
QES	Quality Engineering Services Inc.
RPD	relative percent difference
SAD	South Atlantic Division
SAP/QAPP	Sampling and Analysis Plan/Quality Assurance Project Plan
SAR	Sampling and Analysis Report
SDG	sample data groups
SERIM	Southeast Regional Implementation Manual
SP	solid phase
SPP	suspended particulate phase
STFATE	Short Term Fate
SVOC	semi-volatile organic compounds
TEL	threshold effect levels
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TS	total solids
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFDA	U.S. Food and Drug Administration

1 INTRODUCTION

The Port of Gulfport, Mississippi, is a bulk, break-bulk, and container seaport centrally located on Mississippi's Gulf of Mexico coastline (Figure 1). Recognized as the region's third busiest container port, the Port of Gulfport is developing long-term management and expansion plans. To facilitate the proposed future expansion, the Mississippi State Port Authority (MSPA) is proposing to conduct construction (new work) dredging within a proposed Turning Basin immediately adjacent and south of the existing Turning Basin footprint (Figure 2). This *Sampling and Analysis Report* (SAR) summarizes the sediment sampling event and evaluates data results to determine recommendations and conclusions for dredged material disposal alternatives.

1.1 Project Summary

The MSPA proposed to characterize material to be dredged from within the Turning Basin for ocean placement. Testing for ocean placement included a full suite of physical, chemical, and biological analyses, per the *Southeast Regional Implementation Manual* (SERIM; U.S. Environmental Protection Agency [USEPA] Region IV/U.S. Army Corps of Engineers [USACE] South Atlantic Division [SAD] 2008) and the *Evaluation for Dredged Material Proposed for Ocean Disposal – Testing Manual* (OTM; USEPA/USACE 1991).

The sampling program consisted of physical, chemical, and biological analyses for sediment, site water, and tissue. Sediment samples were analyzed for total solids (TS), grain size, specific gravity, pH, total petroleum hydrocarbons (TPH), total organic carbon (TOC), metals, polycyclic aromatic hydrocarbons (PAH), semi-volatile organic compounds (SVOCs), organometallic compounds, polychlorinated biphenyl (PCB) congeners, pesticides, and biological testing. Biological testing was comprised of solid phase, suspended particulate phase tests, and bioaccumulation tests. Site water and elutriate samples were analyzed for ammonia, cyanide, tributyltin, metal, pesticides, and pentachlorophenol. The tissue analyses included lipids and a subset of chemicals based on the sediment chemistry results.

The sampling area was comprised of ten dredge units (DUs). Three cores were collected from each DU and composited together to form a sample, for a total of ten sediment samples. One site water sample was collected from within the boundary of the sample area.

If the sediment is found suitable for ocean disposal, dredge material may be placed at one of three nearby USEPA-designated Ocean Dredged Material Disposal Site (ODMDS): Gulfport Eastern or Western, or Pascagoula. The USACE has not used Gulfport Eastern ODMDS in recent years, because net littoral drift occurs from east to west resulting in sedimentation outside the disposal site and into the Federal Navigation Channel. The preferred ODMDS had not yet been selected, but will be either Gulfport Western, Pascagoula, or a State provided Beneficial Use Site. As such, reference sediment was collected from each of these two ODMDS sites following the guidelines specified in the SERIM (USEPA Region IV/USACE SAD 2008). Reference sediments were analyzed for the same analyses listed for the sediment samples from the DUs.

1.2 Historical Data Review

Over the last ten years, two projects have required the evaluation of dredged material within the vicinity of the Turning Basin: the Gulfport West Pier Expansion (evaluated in 2002) and the Federal Navigation Channel (evaluated in 2004). The results indicate that, historically, dredged material from the vicinity of the Turning Basin has been found suitable for open ocean disposal.

1.2.1 Gulfport West Pier Expansion 2002

In July 2002, Thompson Engineering and URS Corporation (2003) conducted sediment sampling in the West Pier Expansion area. Nine sediment samples (GP02-01 through GP02-09) were collected and submitted to analytical laboratories for a full Tier III dredged material evaluation. Five of the samples (GP02-03, GP02-05, GP02-06, GP02-08, and GP02-09) were located within the proposed Turning Basin footprint, which was the focus of the Anchor QEA 2012 sampling event. Sediment samples were collected to depths between -38.3 and -41.6 feet mean lower low water (MLLW). The material ranged from silt to silty sand. Chemistry analyses were conducted on each individual core. Most all metals were detected in low concentrations below relevant effects levels (e.g., effects range low [ERL] developed by Long et al. 1995). Antimony, cadmium, selenium, silver, and thallium were not detected in any samples. Arsenic was the only metal to be detected at levels slightly above its ERL. No organic contaminants (polycyclic aromatic hydrocarbons [PAHs], semi-volatile organic compounds [SVOCs], chlorinated pesticides, or polychlorinated biphenyls

[PCBs]) were detected in any samples, with the exception of one individual congener in one sediment sample.

Bioassay and bioaccumulation potential (BP) tests were conducted on three composite samples (three cores per composite sample). Bioassay testing included two solid phase (SP) tests using *Leptocheirus plumulosus* and *Nereis arenaceodentata*, two suspended particulate phase (SPP) tests using *Menidia beryllina* and *Americamysis bahia* (formerly *Mysidopsis bahia*), and one fertilization test using *Lytechinus pictus*. Results of the bioassay tests suggested that project sediment was not acutely toxic to aquatic organisms. Survivorship in the organisms (*Macoma nasuta* and *Nereis virens*) used for the bioaccumulation test was acceptable and tissue samples were analyzed for arsenic and mercury concentrations. Arsenic and mercury concentrations in *M. nasuta* tissue samples exposed to project sediment, as well as mercury concentrations in *N. virens* tissue samples, were not significantly greater than concentrations in tissue samples exposed to project reference sediment sample. Arsenic concentrations in *N. virens* tissue samples exposed to project sediment were significantly greater than arsenic concentrations in tissue samples exposed to project reference sediment; however, arsenic concentrations in *N. virens* tissues exposed to project sediment were at or below arsenic concentrations in day zero tissue samples. Further, mercury and arsenic measured in tissue samples from either organism were below the U.S. Food and Drug Administration's (USFDA) action levels.

These results suggested sediments from the West Pier Expansion Area, including sediment from within the proposed Turning Basin, were suitable for ocean placement.

1.2.2 Gulfport Harbor Federal Navigation Channel 2004

In 2004, EA Engineering, Science and Technology (EA 2006) conducted an evaluation of dredged material within the Gulfport Harbor Federal Navigation Channel for the USACE. Fifteen samples were collected throughout the Gulfport Harbor Anchorage Basin and the Sound Channel to support proposed alternatives for widening and deepening of the federally authorized navigation channel and basin. In the vicinity of the proposed Turning Basin, several samples were evaluated to support maintenance, deepening, or widening alternatives (GH04-01-M, GH04-01-D, GH04-02-M, GH04-02-D, GH04-03-DW, and GH04-03-W); the

results of these specific samples are summarized herein. Sediment samples were collected to project depths between -36 and -38 feet MLLW (depending on the proposed alternative). Sediment was predominantly sand. Metals were detected in low concentrations (i.e., below relevant effects levels) in all samples with a couple of exceptions. Arsenic and nickel were detected in GH04-02-M in concentrations slightly greater than their respective threshold effect levels (TEL). With the exception of PCBs, organic contaminants (PAHs, SVOCs, or chlorinated pesticides) were either non-detect or detected in low concentrations. In GH04-02-D, total PCBs was detected above its TEL by a factor of 5.6.

Bioassay and BP tests were conducted on three composite samples (three cores per composite sample). Bioassay testing included two SP tests using *L. plumulosus* and *N. arenaceodentata*, three SPP tests using *Arbacia punctata*, *A. bahia*, and *Cyprinodon variegatus* and two BP tests using *M. nasuta* and *N. virens*. Results of the bioassay tests suggested that project sediment was not acutely toxic to aquatic organisms, with the exception of SPP tests conducted using sediment from GH04-03-DW; however, Short Term Fate (STFATE) modeling suggested that the limiting permissible concentration (LPC) would be met within the temporal and spatial boundaries of the placement area. Survivorship in the organisms (*M. nasuta* and *N. virens*) used for the bioaccumulation test was acceptable and tissue samples were analyzed for metals, PCB congeners, and dioxin and furan congeners. In all cases, PCB congeners and dioxin and furan congeners exposed to project sediment were not significantly greater than concentrations in tissue samples exposed to the project reference sediment sample. A variety of metals were detected in *M. nasuta* and *N. virens* tissue samples exposed to project sediment; however, further analysis indicated that the uptake ratios were less than one, and/or the metal was either not bioavailable or tended not to bioaccumulate.

The results suggested sediments from the Gulfport Harbor Anchorage Basin and navigation channel, within the vicinity of the proposed Turning Basin, were suitable for ocean placement.

1.3 Objectives of the Sediment Investigation

The objectives of this sediment investigation were to:

1. Collect sediment samples from representative areas within the Turning Basin to determine the suitability of the dredge material for ocean placement.
2. Collect sediment samples from the each of the proposed ODMDs to determine the preferred dredge disposal location.

2 METHODS

2.1 Sample Collection and Handling

Sediment cores were collected from ten DUs within the Turning Basin to evaluate proposed dredge material for ocean disposal. This section details the methods of sample collection and handling, specifically addressing sampling platform, navigation and vertical control, station locations, sample collection procedures, sample characterization and processing, field equipment decontamination and waste disposal, sample shipping, and chain-of-custody (COC) procedures.

2.1.1 Sampling Platform

Sampling was performed from a barge that was 45 feet long and 18 feet wide. The vessel conformed to U.S. Coast Guard safety standards. All field services were provided by Quality Engineering Services Inc. (QES), Long Beach, Mississippi. The vessel was supplied under contract to QES and operated by Shallow Draft Marine. Quality assurance and sample logging were provided by Anchor QEA, LLC.

2.1.2 Navigation and Vertical Control

On-vessel navigation and positioning was accomplished using a global positioning system (GPS). The navigation system was used to guide the vessel to pre-determined core sampling locations, with an accuracy of plus or minus 10 feet. Horizontal positions were reported in Mississippi State Plane coordinates (Mississippi State Plane, East, North American Datum [NAD] 83) to the nearest foot and in latitude and longitude in degrees, decimal minutes (to three decimal places).

Once located at the correct sampling location, station depth was measured using an onboard leadline. The mudline elevation relative to the MLLW datum was determined by adding the tidal elevation to the measured depth. All vertical elevations were reported to the nearest 0.1 foot relative to MLLW.

2.1.3 Station Locations

Three stations were identified within each DU for sediment core sampling. Figure 3 shows the layout of the DUs proposed for dredging and both the proposed and actual core sampling locations. Cores were collected at each sampling location to the project depth (-38 feet MLLW) plus 2 feet of allowable overdepth. Station coordinates, mudline elevations, and core lengths for each station are presented in Table 1. Occasionally, more than one core was required at each station to obtain sufficient volume for the prescribed testing program.

2.1.4 Sample Collection Procedure

Sediment was collected using a drilling rig secured to an 18 by 25 foot jack-up mounted geotechnical boring platform. The drilling rig consisted of a dual tube soil/sediment sampling system. An outer casing housed an inner rod with a 1.85 inch inner diameter acrylic liner and a catcher to retain the sediment. The outer casing was driven into the substrate; the inner rod was then attached to a rod string and placed inside the outer casing. A hammer was used to drive the assembly into the benthic floor until the inner rod was filled with sediment. Upon completion of penetration at a station, the drill was shut down, the position recorded, and the sample recovered. A new liner was inserted into the core tube prior to sampling at each station to eliminate the possibility of cross contamination among stations.

In addition to project sediment, reference sediment and site water were collected for chemistry and biological testing requirements. As the preferred ODMDS has not yet been selected, sediment was collected from one of the designated reference sites for each of the proposed ODMDS following guidelines specified in the SERIM (USEPA Region IV/USACE SAD 2008). For Gulfport Western ODMDS, reference sediment was collected from station RS-GP-C. For the Pascagoula ODMDS, reference sediment was collected from station RS-PAS-A. Site water was collected from the dredge area within 1 meter of the bottom, with care not to disturb the sediment. Site water was collected using a 3.2 liter horizontal Van Dorn water sampler, and placed in low-density polyethylene (LDPE) cubitainers.

2.1.5 Sample Characterization and Processing

Sediment core samples were processed onboard the sampling vessel. Physical characteristics of each core were noted on the individual sediment core collection form (Appendix A). A representative core from each sampling location was photographed. A 500-milliliter (mL) aliquot of the bottom two-feet of each core was archived in the event additional chemistry testing is necessary to delineate the vertical migration of contaminants.

Each core was visually assessed to determine if sediment stratification was present. In all cores except GP-DU10-01 and GP-DU10-02, no stratification was observed. Sediment from these cores was individually homogenized to a uniform consistency in a stainless-steel bowl or high-density polyethylene (HDPE) bucket, whichever best accommodated the collected volume. A proportionate volume, based on relative core lengths, of the homogenized sediment from each core was combined to form a single composite sample for the DU.

For cores GP-DU10-01 and GP-DU10-02, where stratification was observed, sediments were segregated and homogenized based on grain size. A 500-mL subsample of each individual homogenized core was archived to allow for additional chemical analysis, if necessary. Segregated sediments were not composited and were instead tested separately. A sand layer was encountered at GP-DU10-01 from -32 feet to -36 feet. A sand layer was encountered at GP-DU10-02 from -31 feet to -35 feet. The stratification layer from both cores was sampled separately from all other sediment collected at these locations. The stratifications layers were processed in the same manner as all other cores and were composited to form a new, separate, sample, which was submitted for analysis to the analytical laboratory.

Sediment was placed into jars appropriate for physical and chemical analyses, and all jars were firmly sealed with Teflon-lined lids. Waterproof sample labels were filled out with an indelible-ink pen and affixed to the sample containers. Each label contained the project name, sample identification, preservation technique, requested analyses, date and time of collection and preparation, and initials of the person preparing the sample. Remaining sediment (at least 23 L) was placed into clean food-grade polyethylene bags or HDPE buckets and sealed airtight for biological testing. Each container for biological testing was clearly labeled with an indelible-ink pen. Table 2 presents the sediment sample processing and testing strategy.

Samples were temporarily stored in coolers supplied with crushed ice. Temperatures were maintained at approximately 4 degrees Celsius (°C) plus or minus 2°C and monitored throughout storage. Archived core samples will be stored frozen at -20 degrees plus or minus 2°C for up to 1 year after sample collection.

2.1.6 *Field Equipment Decontamination Procedures*

All sampling equipment was decontaminated prior to use and between stations using site water and a phosphate-free biodegradable soap solution as described in the Sampling and Analysis Plan (SAP; Anchor QEA 2012). Any incidental sediment remaining after sampling was washed overboard at the collection site, prior to moving to the next sampling location. Sediment spilled on the deck of the sampling vessel was washed into the surface waters at the collection site after sampling.

All disposable sampling materials and personnel protective equipment used in sample processing (such as disposable coveralls, gloves, and paper towels) were placed into heavy-duty garbage bags and then placed into a refuse container for disposal as solid waste.

2.1.7 *Sample Shipping*

Sediment was delivered directly to a courier employed by the analytical laboratory (TestAmerica). The courier was then responsible for delivering the samples directly to the laboratory. Prior to handing over to the TestAmerica courier, samples were securely packed inside a cooler with crushed ice. The original, signed COC forms were given to the TestAmerica courier. The laboratory project manager ensured that COC forms were properly signed upon receipt of the samples and noted questions or observations concerning sample integrity on the COC forms when applicable. The laboratory sample custodian measured and recorded the temperature of the temperature blank included in each cooler and would specifically note any coolers that did not contain ice packs or were not sufficiently cold upon receipt.

2.1.8 *Chain-of-Custody Procedures*

Proper COC procedures, as outlined in the SAP/Quality Assurance Project Plan

QAPP Section 3.8.2 (Anchor QEA 2012), were followed for all samples throughout the collection, handling, and analysis process. The COC forms were the principal documents used to detail the possession and transfer of samples. The field coordinator was responsible for all sample tracking and COC procedures. This person was responsible for final sample inventory, maintenance of sample custody documentation, and completion of COC and sample tracking forms prior to transferring samples to the laboratory. A COC form accompanied each cooler of samples to the analytical and biological laboratories. Each person who had custody of the samples signed the COC form and ensured that the samples were not left unattended unless properly secured. Copies of all COC forms have been retained in the project files and can be found in Appendix A.

2.2 Physical and Chemical Analyses

Physical and chemical analyses of sediment in this testing program were selected to determine suitability of dredged material for ocean placement. All analytical methods used followed USEPA or American Society for Testing and Materials (ASTM) protocols.

2.2.1 Physical Analyses of Sediment

Physical analyses of sediment included grain size, TOC, total solids, specific gravity, and pH. Recommended analytical methods and target detection limits are presented in the Sampling and Analysis Plan/Quality Assurance Project Plan [SAP/QAPP] (Anchor QEA 2012).

2.2.2 Chemical Analyses of Sediment

Chemical analyses of sediment included metals, PAHs, PCBs, pesticides, organotins, and TPH. Specific chemical and conventional analytes, recommended analytical methods, and target detection limits are presented in the SAP/QAPP (Anchor QEA 2012).

2.2.3 Chemical Analyses of Tissue Residues

Based on a review of the bulk sediment chemistry results and discussion with USEPA Region IV (Appendix B), all tissue samples were analyzed for percent lipids and metals. Samples GP-DU2-COMP, GP-DU3-COMP, GP-DU6-COMP, GP-DU7-COMP and RS-GP-C were also analyzed for PAHs. Samples GP-DU7-COMP and RS-PAS-A were analyzed for PCB

congeners. Specific chemical analytes, recommended analytical methods, and target detection limits are presented in the SAP/QAPP (Anchor QEA 2012).

2.2.4 Quality Assurance/Quality Control

Laboratory quality assurance/quality control (QA/QC) samples included replicates, matrix spike samples, method blanks, laboratory control samples (LCSs) and standard reference material. Surrogates were included for all organic methods. QA/QC objectives and frequency of analysis for laboratory QA/QC samples are summarized in the SAP/QAPP (Anchor QEA 2012).

2.3 Biological Testing

Biological testing was conducted to determine suitability for ocean placement at the Gulfport and/or Pascagoula ODMDS. Biological testing for this project included two SP tests, three SPP tests, and two BP tests, as specified in Table 3 to determine whether anthropogenic contaminants of concern were present at concentrations, such that ocean placement of the dredged material would pose an unacceptable risk of toxicity or bioaccumulation to biota. Evaluation of material followed methods described in the OTM (USEPA/USACE 1991) and the SERIM (USEPA Region IV/USACE SAD 2008) for characterization relative to open-ocean placement requirements. Ten composite samples were tested, representing dredged material from each DU (Figure 3). Reference material from the Gulfport and Pascagoula reference sites were tested, when appropriate (i.e., SP and BP tests). In addition, appropriate control samples were tested for each species to evaluate test acceptability. Specific test methods, conditions, and acceptability requirements are presented in Section 13.3.2 of the SAP/QAPP (Anchor QEA 2012) and in the TRAC Laboratories, Inc. laboratory reports (Appendix C). A summary of the experimental design, recommended and actual water quality ranges, and protocol deviations for each test are presented in Tables 4 through 11. All testing was performed in accordance with the SAP/QAPP, with only a couple modifications.

Because of seasonal availability of spawning *Mytilus edulis*, *Arbacia punctulata* was used as an alternative test species for SPP testing. *A. punctulata* is one of the recommended organisms presented in Table 6-1 of the SERIM (USEPA Region IV/USACE SAD 2008).

The initial SP 10-day amphipod survival test resulted in reduced survivorship to *Leptocheirus plumulosus*, possibly due to low TOC concentrations within project sediments. TOC was less than 1 percent in all samples, with the exception of the Pascagoula reference. In a study by DeWitt et al. (1997), significantly reduced survival of *L. plumulosus* was observed in sediments containing less than 1 percent TOC. Similar reduced survivorship rates in low TOC sediment samples were found in Casotte Landing in Pascagoula, Mississippi (Weston Solutions 2006). A special study was conducted on Casotte Landing sediments where amphipods were fed during the 10-day exposures, resulting in increased survivorship and ocean disposal suitability determination. After a review of the initial SP 10-day amphipod survival test and discussions with USEPA Region IV (Appendix B), additional SP 10-day amphipod tests were conducted using modified testing procedures to include a feeding schedule. The feeding regime was based on the 28-day *L. plumulosus* chronic test procedures (USEPA 2001) and consistent with those used in the Casotte Landing study (Weston Solutions 2006).

These modified methods included providing food to all test chambers on days 0 and 5. Ground Tetramin® flakes were added to seawater to produce a slurry. One milliliter of slurry was introduced to each test chamber to provide 40 mg/chamber/day.

2.3.1 Quality Assurance/Quality Control

All biological tests incorporated standard QA/QC procedures, per the OTM (USEPA/USACE 1991) and ITM (USEPA/USACE 1998), to ensure valid test results. Standard QA/QC procedures included the use of negative controls, positive controls, reference sediment samples, replicates, and measurements of water quality during testing.

The negative control was used to establish the health of the test organisms and ensure acceptability criteria were met. For SP and BP testing, control material consisted of clean sediment provided by the organism supplier. For SPP testing, control material consisted of filtered seawater or artificial seawater prepared with Crystal Sea® marine salt mix and deionized water. Positive controls (i.e., reference toxicant tests) were used to establish the sensitivity of test organisms. The reference toxicant test median lethal concentration (LC₅₀)

or median effective concentration (EC_{50}) should fall within two standard deviations of the historical mean, indicating sensitivity is normal.

Water quality was measured during testing to ensure test conditions were maintained and that organisms did not experience undue stress unrelated to test sediments. Laboratory equipment was maintained, and all instruments were calibrated regularly. All laboratory work was documented on approved datasheets.

3 RESULTS

3.1 Sample Collection and Handling

Sediment cores and site water were collected from November 24 to December 1, 2012. The weather was generally sunny and cool with a light breeze. There were two days of heavy cloud cover, rain, and increased winds. Samples were collected using a Geoprobe direct-push sampler. Refusal was not encountered at any of the stations. Station coordinates, mudline elevation, estimated penetration, and retrieved core lengths for each station location are summarized in Table 1. Field logs are provided in Appendix A.

3.2 Physical and Analytical Chemistry Results

The physical and analytical chemistry results of water, elutriate, and sediment from the Port of Gulfport Turning Basin and reference sites are provided in Table 12 (water and elutriate results) and Table 13 (sediment results). Target detection limits were provided in the SAP/QAPP (Anchor QEA 2012). The actual reporting limits and raw data for the analyses are provided in Appendix C. Site water and elutriate sample results were compared to the National Recommended Water Quality Criteria for Aquatic Life (USEPA 2013) and the Mississippi State Water Quality Standards (MDEQ 2007). All sediment results are expressed in dry weight, unless otherwise indicated, and were compared to the ERL and effects range median (ERM; Long et al. 1995) values (while these values are useful for identifying elevated sediment-associated contaminants, they should not be used to infer causality because of the inherent variability and uncertainty of the approach).

3.2.1 Site Water

Ammonia and cyanide were not detected in the site water. Only total arsenic and total selenium were detected at concentrations greater than the method reporting limit (MRL). Total chromium (III and IV) were estimated at concentrations below the MRL. Dissolved arsenic and selenium were also detected in the site water. Dissolved lead was estimated at a concentration below the MRL. All other total and dissolved metals were not detected. Pentachlorophenol was estimated at concentrations below the MRL. No pesticides were detected in the site water. All analytes were below USEPA and Mississippi State Water Quality Criteria.

3.2.2 Elutriate

Ammonia and several total and dissolved metals, including arsenic, chromium (total), copper, lead, nickel, selenium, and zinc were detected above the MRL in one or more elutriate samples. Cadmium, chromium VI, mercury, and silver were not detected above the MRL in any elutriate sample. In all samples, cyanide, organometallic compounds, semivolatile organics, and pesticides were not detected in any of the elutriate samples. Dissolved copper in the GP-DU5-Comp elutriate sample exceeded the USEPA and Mississippi State Water Quality Criteria by 2.3 times.

3.2.3 Sediment

3.2.3.1 Pascagoula ODMDs Reference Site

Grain size of the Pascagoula ODMDs reference sample (RS-PAS-A) consisted of 49.7 percent clay, 44.6 percent silt, and 5.7 percent sand. Total solids were reported at 32 percent. TOC was reported at 1.4 percent. Specific gravity was reported at 1.3.

All metals analyzed were detected, with the exception of cadmium. Arsenic and nickel concentrations exceeded the corresponding ERL values, but did not exceed the ERM values. No organometallic compounds, SVOCs, PAHs, pesticides, or TPHs were detected in this reference sample. Only one PCB congener, PCB-008, was detected.

3.2.3.2 Gulfport Western ODMDs Reference Site

Grain size of the Gulfport ODMDs reference sample (RS-GP-C) consisted of 68.7 percent clay, 28.6 percent silt, and 2.7 percent sand. Total solids were reported at 36 percent. TOC was reported at 0.9 percent. Specific gravity was reported at 1.3.

All metals analyzed were detected, with the exception of cadmium. Arsenic and nickel concentrations exceeded the corresponding ERL values, but did not exceed the ERM values. No organometallic compounds, SVOCs, pesticides, or PCB congeners were detected. Three PAHs, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene, were detected. 2-Methylnaphthalene exceeded the corresponding ERM value. Naphthalene and total low molecular weight polycyclic aromatic hydrocarbons (LPAH) exceeded the corresponding

ERL values. Diesel range organics (C10-C28) were detected; oil range organics (C28-C40) were not detected.

3.2.3.3 *Composite Area GP-DU1*

Grain size of the sediment sample from GP-DU1 consisted of 46 percent clay, 36.4 percent sand, and 17.6 percent silt. Total solids were measured at a concentration of 49 percent. TOC was measured at a concentration of 0.55 percent. Specific gravity was reported at 1.4.

All metals were detected, with the exception of cadmium. Only arsenic concentrations exceeded the corresponding ERL value, but did not exceed the ERM value. No organometallic compounds, SVOCs, pesticides, or TPHs were detected in the sample. Pyrene was the only detected PAH, and it did not exceed the corresponding ERL value. Only one PCB congener, PCB-008, was detected.

3.2.3.4 *Composite Area GP-DU2*

Grain size of the sediment sample from GP-DU2 consisted of 36 percent clay, 42.3 percent sand, and 21.7 percent silt. Total solids were measured at a concentration of 52 percent. TOC was measured at a concentration of 0.45 percent. Specific gravity was reported at 1.5.

All metals were detected, with the exception of cadmium. Only arsenic concentrations exceeded the corresponding ERL value, but did not exceed the ERM value. No organometallic compounds, SVOCs, pesticides, or TPHs were detected in the sample. Three PAHs, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene, were detected. 2-Methylnaphthalene, naphthalene, and total LPAH exceeded the corresponding ERM values. Only one PCB congener, PCB-008, was detected.

3.2.3.5 *Composite Area GP-DU3*

Grain size of the sediment sample from GP-DU3 consisted of 35.8 percent clay, 46.1 percent sand, and 18.1 percent silt. Total solids were measured at a concentration of 56 percent. TOC was measured at a concentration of 0.44 percent. Specific gravity was reported at 1.5.

All metals were detected, with the exception of cadmium. Only arsenic concentrations exceeded the corresponding ERL value, but did not exceed the ERM value. No organometallic compounds, SVOCs, pesticides, or TPHs were detected in the sample. Three PAHs, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene, were detected. Only 2-methylnaphthalene exceeded the corresponding ERL value. Only one PCB congener, PCB-008, was detected.

3.2.3.6 *Composite Area GP-DU4*

Grain size of the sediment sample from GP-DU4 consisted of 69.4 percent clay, 24.4 percent silt, and 6.2 percent sand. Total solids were measured at a concentration of 44 percent. TOC was measured at a concentration of 0.72 percent. Specific gravity was reported at 1.4.

All metals were detected, with the exception of cadmium and mercury. Only arsenic concentrations exceeded the corresponding ERL value, but did not exceed the ERM value. No organometallic compounds, SVOCs, PAHs, pesticides, or TPHs were detected in the sample. Only one PCB congener, PCB-008, was detected.

3.2.3.7 *Composite Area GP-DU5*

Grain size of the sediment sample from GP-DU5 consisted of 72 percent clay, 25.2 percent silt, and 2.8 percent sand. Total solids were measured at a concentration of 43 percent. TOC was measured at a concentration of 0.76 percent. Specific gravity was reported at 1.4.

All metals were detected, with the exception of cadmium. Arsenic and nickel concentrations exceeded the corresponding ERL values, but did not exceed the ERM values. No organometallic compounds, SVOCs, PAHs, pesticides, or TPHs were detected in the sample. Three PCB congeners, PCB-008, PCB-028, and PCB-066, were detected.

3.2.3.8 *Composite Area GP-DU6*

Grain size of the sediment sample from GP-DU6 consisted of 56 percent clay, 26.7 percent silt, and 17.3 percent sand. Total solids were measured at a concentration of 46 percent. TOC was measured at a concentration of 0.62 percent. Specific gravity was reported at 1.4.

All metals were detected, with the exception of cadmium. Arsenic concentrations exceeded the corresponding ERL value, but did not exceed the ERM value. No organometallic compounds, SVOCs, pesticides, or TPHs were detected in the sample. Three PAHs, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene, were detected. 2-Methylnaphthalene, naphthalene, and total LPAH exceeded the corresponding ERL values. Two PCB congeners, PCB-028 and PCB-066, were detected.

3.2.3.9 Composite Area GP-DU7

Grain size of the sediment sample from GP-DU7 consisted of 67.5 percent clay, 21.9 percent silt, and 10.6 percent sand. Total solids were measured at a concentration of 45 percent. TOC was measured at a concentration of 0.65 percent. Specific gravity was reported at 1.4.

All metals were detected, with the exception of cadmium. Arsenic concentrations exceeded the corresponding ERL value, but did not exceed the ERM value. No organometallic compounds, SVOCs, pesticides, or TPHs were detected in the sample. Three PAHs, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene, were detected. 2-Methylnaphthalene, naphthalene, and total LPAH exceeded the corresponding ERL values. Four PCB congeners, PCB-028, PCB-044, PCB-052, and PCB-066, were detected.

3.2.3.10 Composite Area GP-DU8

Grain size of the sediment sample from GP-DU8 consisted of 42.6 percent clay, 30.3 percent silt, and 27.1 percent sand. Total solids were measured at a concentration of 52 percent. TOC was measured at a concentration of 0.68 percent. Specific gravity was reported at 1.5.

All metals were detected, with the exception of cadmium. Arsenic concentrations exceeded the corresponding ERL value, but did not exceed the ERM value. No organometallic compounds, SVOCs, PAHs, pesticides, or TPHs were detected in the sample. Four PCB congeners, PCB-008, PCB-028, PCB-066, and PCB-101, were detected.

3.2.3.11 Composite Area GP-DU9

Grain size of the sediment sample from GP-DU9 consisted of 61.4 percent clay, 28 percent silt, and 10.6 percent sand. Total solids were measured at a concentration of 44 percent. TOC was measured at a concentration of 0.68 percent. Specific gravity was reported at 1.4.

All metals were detected, with the exception of cadmium. Arsenic and nickel concentrations exceeded the corresponding ERL values, but did not exceed the ERM values. No organometallic compounds, SVOCs, PAHs, pesticides, or TPHs were detected in the sample. Two PCB congeners, PCB-028 and PCB-066, were detected.

3.2.3.12 Composite Area GP-DU10

Grain size of the sediment sample from GP-DU10 consisted of 57.3 percent sand, 29.2 percent clay, and 13.5 percent silt. Total solids were measured at a concentration of 54 percent. TOC was measured at a concentration of 0.63 percent. Specific gravity was reported at 1.5.

All metals were detected, with the exception of cadmium. Arsenic concentrations exceeded the corresponding ERL value, but did not exceed the ERM value. No organometallic compounds, SVOCs, PAHs, pesticides, or PCB congeners were detected in the sample. Diesel range organics (C10-C-28) were detected.

3.2.4 Quality Assurance/Quality Control

A review of analytical results for the site water, elutriate, and sediment samples collected as part of this investigation was conducted to evaluate the laboratory's performance in meeting QA/QC guidelines outlined in the SAP. The data validation reports conducted by Anchor QEA are presented in Appendix D.

The data validation was performed under USEPA guidelines, as described in the SAP and the National Functional Guidelines for Data Review (USEPA 1999; USEPA 2004; USEPA 2008).

Data validation verified the accuracy and precision of chemical determinations performed during this investigation. Data qualifiers assigned as a result of the data validation and their

definitions are shown on each of the respective analytical results tables and in the data validation reports. Data may have been qualified as biased or estimated for a particular analysis based on method or technical criteria. Data qualified with a “J” indicates that the associated numerical value is the approximate concentration of the analyte. Data qualified with a “UJ” indicates the approximate reporting limit below which the analyte was not detected. Consequently, these data qualifications are not expected to impact the data quality objectives and all data were determined to be useable as reported from the laboratory or as qualified for the purpose of dredged material characterization.

Laboratory method blanks were analyzed as the required frequencies. All method blanks were free of target analytes with the exceptions of arsenic and lead, which were detected at levels between the method detection limit (MDL) and the MRL in one of the metals blanks associated with several SDGs. All associated sample results were significantly greater ($>5x$) the levels detected in the blanks; thus no data were qualified. Hexavalent chromium was detected at a level between the MDL/MRL in the method blank associated with the water sample in one SDG (700-72953-1). Associated samples that were not below detection or significantly greater than ($>5x$) the level detected in the method blank have been qualified as non-detects.

Laboratory control samples (LCS) and laboratory control sample duplicates (LCSD) were analyzed at the required frequencies. All LCS/LCSD analyses yielded percent recovery (%R) and/or relative percent difference (RPD) values within laboratory control limits with the following exceptions:

- Oil range organics (ORO) – the LCS associated with the sediments was not spiked with the appropriate standard; however, no peaks were detected in the retention time window for these compounds. All results were qualified “UJ” to indicate that they were estimated.
- Pesticides – the LCSD associated with the sediments in all SDGs and the LCS associated with the water samples in analytical batch 125686 recovered above control limits for 4,4'-DDT. This compound was not detected in any associated samples and no qualification was necessary. The LCS/LCSD RPDs associated with the sediment samples in all SDGs and the water samples associated with analytical batch 125686 were above control limits for 4,4'-DDT and methoxychlor. These compounds were

not detected in any associated samples and results were qualified to “UJ” to indicate they were estimated.

- Organometallic compounds – The LCS associated with the sediment and water samples in all SDGs recovered below control limits for monobutyltin. The compound was not detected in any associated samples and results were qualified with “UJ” to indicate they were estimated.
- SVOCs – The LCS associated with all water samples in SDG 700-72953-1 recovered below control limits for pentachlorophenol. This compound was not detected in any associated samples, and results have been qualified “UJ” to indicate that they were estimated.

Matrix spikes (MS) and matrix spike duplicates (MSD) samples were analyzed at the required frequencies, with the exceptions of TOC, organometallic compounds, and SVOCs. Accuracy was assessed for these parameters using the LCS/LCSD %R values. All MS/MSD analyses yielded %R and/or RPD values within laboratory control limits with the following exceptions:

- The MS/MSD analyses performed on sample GP-DU9-COMP did not recover for ORO; however, the MS/MDS was not spiked with the appropriate standard. No peaks were detected in the retention time window for these compounds. All results were qualified “UJ” to indicate they were estimated.
- The MS/MSD analyses performed on sample GP-DU3-COMP recovered below control limits for 4,4'-DDT, alpha-BHC, endosulfan I, and methoxychlor. These compounds were not detected in the parent sample and the results were qualified “UJ” to indicate a potentially low bias.

3.2.4.1 Site Water

No data were qualified for the site water sample. Sediment and elutriate sample qualifiers were assigned as follows. Samples were appropriately preserved and analyzed within holding times with a few exceptions:

- Samples from all sample data groups (SDG) were analyzed outside of the project specific holding time for TOC. All sample results were qualified “J” to indicate they were estimated.

- Sample GP-DU10-COMP was extracted and/or analyzed outside of the project specific holding times for diesel range organics, organometallic compounds, and pH. Sample results were qualified “J” or “UJ” to indicate they were estimated.
- Sample GP-DU9-COMP was extracted outside of the project specific holding time for organometallic compounds. Sample results were qualified “UJ” to indicate they were estimated.

3.2.4.2 *Elutriates*

No data were qualified for total cyanide, ammonia, or total metals (including mercury). The hexavalent chromium reporting limits for two samples (GP-DU3-COMP, GP-DU1-COMP) were elevated due to method blank contamination. All samples were qualified for monobutyltin due to low recoveries in the LCS. Two pesticide results in all samples were qualified as estimated due to a LCS/LCSD RPD value above the control limit. PCP results in five samples (GP-DU1-COMP through GP-DU5-COMP) were qualified due to a low LCS recovery.

3.2.4.3 *Sediment*

No data were qualified for TS, GS, specific gravity, total metals (including mercury), PCB congeners, or SVOCs. All TOC data were qualified due to analyses performed past the 14-day hold time recommended in the SAP and SERIM. The laboratory uses a 28-day hold time, which is consistent with an USEPA SW-846 1999 update to the method. Organotin data for two samples (GP-DU10-COMP and GP-DU9-COMP) and pH, DRO, and ORO data for one sample (GP-DU10-COMP) were also qualified due to hold time exceedances. Four pesticide results in sample GP-DU3-COMP were qualified as estimated due to low MS/MSD recoveries. Two pesticide results in all samples were qualified as estimated due to a LCS/LCSD RPD value above the control limit. All samples were qualified for monobutyltin due to low recoveries in the LCS. All samples were qualified for ORO because the LCS and MS/MSD were not spiked with an appropriate standard; however, no peaks were detected in the retention time window for these compounds.

The laboratory followed the specified analytical methods and all requested sample analyses were completed. Accuracy and precision were deemed acceptable, with the exceptions

noted above. Most data were deemed acceptable as reported; all other data were acceptable as qualified.

3.3 Results of Biological Testing

Biological testing results for Gulfport Turning Basin sediments are summarized in this section. The laboratory reports, including detailed results and raw data, are provided in Appendix C.

3.3.1 Solid Phase Testing

3.3.1.1 Amphipod Mortality Bioassay

Test results for the SP 10-day amphipod test are presented in Table 14. Mean survival in the control was 97 and 94 percent, which met control acceptability criteria. Mean survival in the Pascagoula reference sample was 71 percent, which did not meet the minimum reference survival criteria of 73 percent (USEPA Region IV/USACE SAD 2008). Mean survival in the Gulfport reference sample was 84 percent. Mean survival in Gulfport Turning Basin samples ranged from 47 to 83 percent. Results were compared to the Gulfport reference sample to determine suitability for ocean disposal. Survival in samples GP-DU1 (48 percent), GP-DU4 (61 percent), GP-DU8 (47 percent), and GP-DU10 (63 percent) was significantly lower than the reference sample and more than 20 percent different, indicating samples are not suitable for ocean disposal. All water quality measurements were within the recommended limits. The LC₅₀ for the reference toxicant test was within control limits, indicating test organism sensitivity was normal.

All project samples exhibited consistently low survival (significantly less than the control). As described in Section 2.3, this was potentially due to low TOC concentrations (less than 1 percent) in project sediments. After discussions with USEPA Region IV, samples GP-DU1, GP-DU4, GP-DU8, and GP-DU10¹ were re-tested using modified procedures that included a feeding regime following guidelines for the 28-day *L. plumulosus* chronic test (USEPA 2001).

¹ Composite sample GP-DU10 consisted of sediment from GP-DU10A and GP-DU10B, each representing a different depth interval. All of GP-DU10A was used during compositing of sample GP-DU10. During the initial testing and analysis, all of sample GP-DU10 was used. Due to insufficient volume of the composite sample, the amphipod re-test only consisted of sediment from GP-DU10B; however, results are believed to be representative of the dredge area.

Test results for the SP 10-day amphipod re-test are presented in Table 15. Mean survival in the control was 100 percent, which met control acceptability criteria. Mean survival in samples GP-DU1, GP-DU4, GP-DU8, and GP-DU10B ranged from 98 to 100 percent. Based on these results, Gulfport Turning Basin sediments are not acutely toxic to amphipods and meets LPC requirements for ocean disposal. All water quality measurements were within the recommended limits. The LC₅₀ for the reference toxicant test was within control limits, indicating test organism sensitivity was normal.

3.3.1.2 Polychaete Mortality Bioassay

Test results for the SP 10-day polychaete test are presented in Table 16. Mean survival in the control was 100 percent for both treatments, which met control acceptability criteria. Mean survival in the Pascagoula and Gulfport reference samples were 100 and 96 percent, respectively. Mean survival in Gulfport Turning Basin samples ranged from 94 to 100 percent. Based on these results, Gulfport Turning Basin sediments are not acutely toxic to polychaetes and meets LPC requirements for ocean disposal.

All water quality measurements were within the recommended limits. The LC₅₀ for the reference toxicant test was slightly outside the upper control limit. Control limits are expected to be exceeded in approximately 5 percent of tests (USEPA 2002). In addition, very narrow control limits were developed for this species due to a lack of partial mortalities bracketing the estimated LC₅₀ concentrations, resulting in identical LC₅₀ values for multiple tests. This slight deviation is not believed to affect the overall interpretation of test results.

3.3.2 Suspended Particulate Phase Testing

3.3.2.1 Sea Urchin Larval Development Bioassay

Test results for the 48-hour echinoderm SPP test are presented in Table 17. Mean normal development in the control was 76 and 78 percent, which met control acceptability criteria. Mean survival in the control was 82 and 83 percent, which met control acceptability criteria. Mean normal development in site water was 71 and 74 percent. Mean survival in site water was 77 and 80 percent. Mean normal development in Gulfport Turning Basin elutriate concentrations ranged from 60 to 79 percent. Mean survival in Gulfport Turning Basin elutriate concentrations ranged from 63 to 86 percent. For each sample, abnormal

development and mortality was less than 50 percent; therefore, the EC₅₀ and LC₅₀, respectively, were assumed to be greater than 100 percent. Statistically significant reductions in normal development were observed in elutriate treatments from GP-DU6, GP-DU7, GP-DU8, and GP-DU10. Given a statistically significant reduction in normal development, SERIM (USEPA Region IV/USACE SAD 2008) guidelines require running a water column toxicity mixing model (i.e., STFATE) of the disposal site to determine compliance. Results of STFATE are presented separately in Section 3.4. Statistical results of STFATE modeling are included as Appendix E.

All water quality measurements were within the recommended limits, with the exception of a minor deviation in pH. The pH of sample GP-DU6 (8.4) was slightly outside the optimal range presented in the SERIM (7.8 ± 0.5 ; USEPA Region IV/USACE SAD 2008). This minor deviation is not expected to affect the overall results. The LC₅₀ for the reference toxicant test was within control limits, indicating test organism sensitivity was normal.

3.3.2.2 *Mysid Shrimp Bioassay*

Test results for the 96-hour mysid SPP test are presented in Table 18. Mean survival in the control was 100 percent, which met control acceptability criteria. Mean survival in site water was 96 percent. Mean survival in Gulf Turning Basin elutriate concentrations ranged from 94 to 100 percent. For each sample, mortality was less than 50 percent; therefore, the LC₅₀ was assumed to be greater than 100 percent. No statistically significant reductions in survival were observed. Based on these results, Gulfport Turning Basin sediments are not acutely toxic to crustaceans and meets LPC requirements for ocean disposal.

All water quality measurements were within the recommended limits, with the exception of a minor deviation in pH. The pH of sample GP-DU6 (8.4) was slightly outside the optimal range presented in the SERIM (7.8 ± 0.5 ; USEPA Region IV/USACE SAD 2008). This minor deviation is not expected to affect the overall results. The LC₅₀ for the reference toxicant test was within control limits, indicating test organism sensitivity was normal.

3.3.2.3 *Juvenile Fish Bioassay*

Test results for the 96-hour fish SPP test are presented in Table 19. Mean survival in the control was 96 percent, which met control acceptability criteria. Mean survival in site water was 94 percent. Mean survival in Gulf Turning Basin elutriate concentrations ranged from 74 to 100 percent. For each sample, mortality was less than 50 percent; therefore, the LC₅₀ was assumed to be greater than 100 percent. Statistically significant reductions in survival were observed in elutriate treatments from GP-DU4 and GP-DU9. Given a statistically significant reduction in survival, SERIM (USEPA Region IV/USACE SAD 2008) guidelines require running a water column toxicity mixing model (i.e., STFATE) of the disposal site to determine compliance. Results of STFATE are presented separately in Section 3.4. Statistical results of STFATE modeling are included as Appendix E.

All water quality measurements were within the recommended limits, with the exception of a minor deviation in pH. The pH of sample GP-DU6 (8.4) was slightly outside the optimal range presented in the SERIM (7.8 ± 0.5 ; USEPA Region IV/USACE SAD 2008). This minor deviation is not expected to affect the overall results. The LC₅₀ for the reference toxicant test was within control limits, indicating test organism sensitivity was normal.

3.3.3 *Bioaccumulation Potential Testing*

Test results for the 28-day BP tests are presented below. Following the 28-day exposure, organisms were placed into clean seawater for 24-hours to allow the organisms to depurate the test sediment. After this purging process, tissues were shipped frozen to TestAmerica for chemical analyses. Results of chemical analyses are presented separately in Section 3.5. Statistical results of testing are included as Appendix F.

3.3.3.1 *Bivalve Bioaccumulation Test*

Test results for the 28-day clam BP test are presented in Table 20. Mean survival in the control was 93 percent, which met control acceptability criteria. Mean survival in the Pascagoula and Gulfport reference samples were 100 and 98 percent, respectively. Mean survival in Gulfport Turning Basin samples ranged from 60 to 95 percent. Survival in two samples (GP-DU1 and GP-DU4) did not meet the minimum test treatment survival criteria of 75 percent (USEPA Region IV/USACE SAD 2008); however, sufficient tissue mass was

available at test completion for all of the required chemical analyses. All water quality measurements were within the recommended limits.

3.3.3.2 *Polychaete Bioaccumulation Test*

Test results for the 28-day polychaete BP test are presented in Table 21. Mean survival in the control was 96 percent, which met control acceptability criteria. Mean survival in the Pascagoula reference sample was 92 percent. Mean survival in the Gulfport reference sample was 64 percent, which did not meet the minimum reference survival criteria of 90 percent (USEPA Region IV/USACE SAD 2008). Mean survival in Gulfport Turning Basin samples ranged from 28 to 100 percent. Survival in two samples (GP-DU7 and GP-DU10) did not meet the minimum test treatment survival criteria of 75 percent (USEPA Region IV/USACE SAD 2008). These results were not unexpected, given the low TOC concentrations (less than 1 percent) in project sediments. Sufficient tissue mass was available at test completion for all of the required chemical analyses, with the exception of three replicates from GP-DU10.² Due to the reduced number of replicates from GP-DU10, a direct (non-statistical) comparison was made with reference tissue samples (see Section 3.5). All water quality measurements were within the recommended limits.

3.3.4 *Quality Assurance/Quality Control*

All biological tests incorporated standard QA/QC procedures, as described in Section 2.3.1. Bioassay tests included both negative and positive controls (i.e., reference toxicant tests). All test organism responses within the negative controls met acceptability requirements. The reference toxicant tests LC₅₀ and/or EC₅₀ for each test species were within control limits (two standard deviations of the laboratory mean), with the exception of *N. arenaceodentata*. As described in Section 3.3.1.2, the LC₅₀ for the *N. arenaceodentata* reference toxicant test was slightly outside the upper control limit. Control limits are expected to be exceeded in approximately 5 percent of tests (USEPA 2002). In addition, very narrow control limits were developed for this species. This is not believed to affect the overall interpretation of test results. Reference toxicant test data for each species are provided in the laboratory reports (Appendix C).

² On February 13, 2013, USEPA Region IV was notified of bioaccumulation test samples that did not meet minimum survival criteria listed in the SERIM (USEPA Region IV/USACE SAD 2008; Appendix B).

Water quality was measured during testing. All water quality conditions were within the appropriate limits, with the exception of minor deviations in pH. During SPP testing, pH in GP-DU6 drifted slightly above optimal range presented in the SERIM (USEPA Region IV/USACE SAD 2008). This minor deviation is not believed to affect the overall test results. Raw water quality data are provided in the laboratory reports (Appendix C).

Samples were transported on ice and received at 0 to 6°C. Upon receipt, samples were stored at 4 plus or minus 2°C. All tests were initiated within the maximum 8-week holding period, with the exception of the amphipod re-test of sample GP-DU10B. Testing of this sample was initiated only 2 days beyond the holding period and test chambers were set up with sediment and overlying water only 1 day beyond the holding period. The re-test was performed to provide supporting evidence that low TOC concentrations impacted amphipod survival during the initial test. This slight exceedance of the holding period is not believed to have impacted test results. Mean survival was consistent with the other low TOC samples re-tested in the same batch which were within the holding period. Test organisms were obtained from commercial suppliers and were within the appropriate age or size classes specified in testing protocols.

Per SERIM guidance, chemical analyses of background tissues should be conducted for three individual replicates (USEPA Region IV/USACE SAD 2008). The laboratory inadvertently composited all background tissues into a single sample for each species. Per communication with USEPA Region IV (Appendix B), the single sample was split into three replicates to correct the error prior to chemical analyses. Since background organisms had not been exposed to test sediments, this error did not affect the outcome of test results.

3.4 Prediction of Water Column Toxicity During Disposal

STFATE is a data modeling tool used to evaluate the suitability of proposed dredged material for placement at an ODMDS. The model simulates the movement of disposed material through the water column to the ocean bottom and then as it becomes re-suspended by the current. STFATE modeling is required under SERIM guidance when results of the 100 percent elutriate concentrations in SPP tests show a significant difference from the control. This occurred in two of the SPP tests (sea urchin and juvenile fish).

The STFATE model uses the 0.01 of the LC₅₀ value to determine compliance with the LPC. The LC₅₀ for all project sediments in both the sea urchin and juvenile fish SPP tests was assumed to be greater than 100 percent, because mortality was less than 50 percent in all sediments. Therefore, the toxicity criterion, or LPC, was 1 percent. The guidance states that the concentration of dredged material must be less than 0.01 times the LC₅₀: 1) after 4 hours within the disposal site; and 2) at all times outside the disposal site.

The STFATE model was run for four distinct disposal sites: Pascagoula ODMDs Zones A, B, and C, and Gulfport Western ODMDs. The input parameters for each disposal site are listed in Table 22; complete results are included in Appendix E. The model was run for different dredge scenarios including both mechanical and hopper dredges and for a range of disposal volumes ranging from 4000 to 13,000 cubic yards (CY). The lower end of the range was selected based on the typical capacity of mechanical dredges, while the higher end was based on the maximum capacity of the hopper dredge, *M/V Glenn Edwards* owned by Manson Construction. Physical characteristics of sediment from GP-DU6 were used as inputs to the model because that test sediment had the lowest corresponding endpoint value (e.g., mean normal development) of all sediments that were significantly different than their respective controls. Site specific input parameters were taken directly from the SERIM (USEPA Region IV/USACE SAD 2008).

3.4.1 Results of STFATE Modeling

STFATE modeling results were used to determine the maximum disposal volume that would produce a concentration of dredged material that would be less than 0.01 of the LC₅₀ (i.e., less than 1 percent) after 4 hours within any of the four ODMDs zones (Table 23) and never greater than 1 percent outside the disposal site boundaries (Table 24). For the Pascagoula ODMDs, the maximum disposal volume was 13,000 CY, resulting in a maximum concentration within the disposal boundary of 0.370 percent after 4 hours (Zone B with a hopper dredge). The plume dissipated before it reached the disposal site boundary. For Gulfport Western ODMDs, the maximum disposal volume which met the LPC criteria of 1 percent was 8,000 CY (for either a mechanical or hopper dredge), resulting in maximum concentration within the disposal boundary was 0.280 percent after 4 hours. The maximum concentration observed outside the disposal site was 0.950 percent (mechanical dredge).

Based on STFATE modeling results, all sediments tested in the sea urchin and fish SPP tests that were significantly different than their respective controls met the LPC requirements for ocean disposal assuming a maximum disposal of 13,000 CY in any of the three Pascagoula ODMDs zones and a maximum disposal of 8,000 CY in the Gulfport Western ODMDs.

3.5 Results of Chemical Analyses of Tissue Residues

Sediment bioaccumulation tests were conducted using the clam *M. nasuta* and the polychaete *Nereis virens*. Chemical analyses of tissue residues were conducted to determine the bioaccumulation potential of sediment contaminants. Based on the results of sediment chemistry, a subset of chemicals was selected for analysis that included metals, PAHs, and/or PCBs. Contaminants measured in tissues from test organisms were compared to background contaminant levels measured in organisms not exposed to test sediments. Results of chemical analyses of bivalve and polychaete tissue residues are presented in Tables 25 and 26, respectively. All results are expressed in wet weight. Target detection limits were provided in the SAP/QAPP (Anchor QEA 2012). Actual RLs and MDLs and raw data for the analyses are provided in Appendix C.

3.5.1 Bivalve Tissue Residues

Results of chemical analyses of clam *M. nasuta* tissue residues are presented in Table 25. All metals were detected in at least one sample, with the exception of cadmium. Within the background sample and Pascagoula reference (RS-PAS-A), mercury was also not detected. Other metals were all detected in the background and reference samples. Arsenic, copper, nickel, and zinc were detected in at least one replicate of all DUs. Concentrations of metals for each individual replicate and replicate averages are presented in Table 26.

PAHs were not detected in the background sample. All concentrations in the project and reference samples were non-detect, with the exception of naphthalene in one replicate of the Gulfport reference (RS-GP-C) and one replicate from DU6. Concentrations of naphthalene in these replicates were 21 and 17 micrograms per kilogram ($\mu\text{g/kg}$), respectively.

PCBs were detected in the background sample, with total PCB congener (USEPA Region 4) concentrations ranging from an estimated 12.74 to 545.4 $\mu\text{g/kg}$. PCBs were detected in all

replicates of the Pascagoula reference (RS-PAS-A) and one replicate of DU7. Within the reference sample, total PCB concentrations ranged from an estimated 12.74 to 54.23 µg/kg. Within DU7, the total PCB concentration of this replicate was an estimated 13 µg/kg.

3.5.2 Polychaete Tissue Residues

Results of chemical analyses of polychaete *N. virens* tissue residues are presented in Table 26. All metals were detected in at least one sample, with the exception of cadmium. Within the Pascagoula reference (RS-PAS-A), chromium and lead were also not detected. Other metals were all detected in the background and reference samples. Arsenic and zinc were detected in at least one replicate of all DUs. Concentrations of metals for each individual replicate and replicate averages are presented in Table 26.

PAHs were not detected in the background sample. All concentrations in the project and reference samples were non-detect, with the exception of naphthalene in four replicates of the Gulfport reference (RS-GP-C). Concentrations of naphthalene in these replicates ranged from 43 to 110 µg/kg.

PCBs were detected in the background sample, with total PCB congener (USEPA Region 4) concentrations ranging from an estimated 23.51 to 26.16 µg/kg. PCBs were detected in all replicates of the Pascagoula reference (RS-PAS-A) and four replicates of DU7. Within the reference sample, total PCB concentrations ranged from an estimated 27.4 to 3,915 µg/kg. Within DU7, total PCB concentrations within these replicates ranged from an estimated 51.25 to 83.98 µg/kg.

3.5.3 Comparisons of Tissue Burdens to U.S. Food and Drug Administration Action Levels

A comparison to USFDA action levels for poisonous or deleterious substances in fish and shellfish for human food is presented in Tables 25 and 26. Sample tissue results were statistically compared (95 percent upper confidence limit) to USFDA action levels using ProUCL version 4.0. The Pascagoula reference (RS-PAS-A) polychaete tissue sample 95 percent upper confidence limit (2,933 µg/kg) exceeded the action level for total PCB congeners (USEPA Region 4). No Gulfport Turning Basin tissue results were statistically

greater than action levels (Tables 25 and 26). Action levels have not been established for copper, selenium, silver, zinc, or PAHs. USFDA actions levels were not exceeded in project samples or absent; therefore, results were also compared to tissue concentrations of organisms exposed to reference sediment.

3.5.4 Comparison of Proposed Dredged Material Tissue Burdens to Reference Sediment Tissue Burdens

Bioaccumulation data were analyzed by statistically comparing chemical concentrations in tissues of organisms exposed to project material to tissues of organisms exposed to reference sediment in accordance with the Appendix D of the ITM (USEPA/USACE 1998). Only project tissue chemistry results from *M. nasuta* and *N. virens* that were elevated above corresponding reference tissue chemistry results were statistically compared. No statistical analyses were performed on tissue chemistry data if both the project area data and the reference data were non-detects or if there were insufficient data available for statistical analyses (i.e., $n < 3$). Results of statistical analyses for *M. nasuta* and *N. virens* are presented in Tables 27 and 28, respectively. Raw data for the analyses is presented in Appendix C; complete results of statistical comparisons are provided in Appendix F. For both species, no analytes were statistically elevated in project tissue samples relative to reference tissue samples (Tables 27 and 28). *N. virens* mortality was 100 percent within three replicates from GP-DU10; therefore, statistical analyses could not be performed. Mean tissue concentrations within GP-DU10 were less than reference samples with the exception of copper and nickel. Copper and nickel concentrations were similar to reference tissue concentrations and less than background concentrations (Table 28). Based on these results, all DUs meet LPC compliance for ocean disposal and further evaluation of data, including a comparison to residue-effects values provided in the ERED (USACE/USEPA 2009), was not performed.

3.5.5 Quality Assurance/Quality Control

A review of analytical results for tissues was conducted to evaluate the laboratory's performance in meeting QA/QC guidelines outlined in the SAP/QAPP (Anchor QEA 2012). The data validation reports conducted by Anchor QEA are presented in Appendix D. All samples were appropriately preserved and analyzed within holding times.

Laboratory method blanks were analyzed at the required frequencies. All method blanks were free of target analytes with the exception of some metals. The following metals were detected in at least one method blank at levels between the MDL and RL: arsenic, chromium, copper, lead, selenium, silver, and zinc. Associated detected results that were not significantly greater than levels detected in the method blank were qualified as non-detects. All surrogate recoveries were within the laboratory control limits with the following exceptions:

- SVOCs – One surrogate in two samples recovered above the control limit. The other two surrogates recovered within control limits; therefore, no data were qualified. Twelve surrogates recovered below control limits in seven samples. No data were qualified when only one surrogate recovered below the control limit. All results for five samples were qualified “UJ” to indicate a potentially low bias due to recoveries of two surrogates below control limits.
- PCBs – One surrogate recovered above the control limit in two samples. Associated detected sample results in one sample were qualified “J” to indicate a potentially high bias. The other sample was analyzed at a high enough dilution that the surrogate could not be accurately quantitated and results were not qualified.

LCS and LCSD were analyzed at the required frequencies. All LCS/LCSD analyses resulted in recoveries and/or RPD values within laboratory control limits with the following exceptions:

- SVOCs – the LCS and/or LCSD recovered below the control limits for benzo(b)fluoranthene, pentachlorophenol, and fluorene. The LCS/LCSD RPD values for fluoranthene and fluorene were above the control limit. Associated results were qualified “UJ” to indicate a potentially low bias or that results are estimated.

MS and MSD samples were analyzed at required frequencies, with the exceptions of SVOCs and PCBs. Accuracy and precision was assessed for these parameters using the LCS/LCSD recoveries and RPD values. All MS/MSD analyses resulted in recoveries and/or RPD values within project-required control limits with the following exceptions:

- Zinc recovered below the control limit in the MSD and/or MSD analyzed on samples GP-DU9 *N. Virens* Worm Rep D, GP-DU1 *N. Virens* Worm Rep D, and GP-DU2 *N.*

Virens Worm Rep B. Associated sample results were qualified “J” to indicate a potentially low bias.

- Zinc recovered above the control limit in the MSD analyzed on sample GP-DU3 *N. Virens* Worm Rep D. Associated sample results were qualified “J” to indicate a potentially high bias.
- Mercury recovered below the control limit and below 30 percent in the MS and MSD analyzed on sample Background Tissue *N. Virens* Triplicate A and the MS/MSD RPD value was above the control limit. Associated detected sample results were qualified “J” to indicate a potentially low bias and non-detected results were rejected. Mercury results were rejected for 15 samples.
- Mercury recovered below the control limit in the MS and MSD analyzed on samples GP-DU1 *N. Virens* Worm Rep E, GP-DU2 *N. Virens* Worm Rep B, and GP-DU3 *N. Virens* Worm Rep D. Associated sample results were qualified “J” or “UJ” to indicate a potentially low bias.

The laboratory followed the specified analytical methods and all requested sample analyses were completed. Accuracy and precision were deemed acceptable, with the exceptions noted above. Most data were deemed acceptable as reported; most other data were acceptable as qualified. Fifteen mercury results were rejected due to very low recoveries in the MS/MSD analyses; however, data completeness met 90 percent data quality objective listed in the SAP/QAPP (Anchor QEA 2012).

4 DISCUSSION

4.1 Physical and Analytical Chemistry Results

4.1.1 *Water*

Site water and elutriates were analyzed for contaminants of concern. No contaminants of concern were detected above MRLs in site water with the exception of two metals. All detected analytes were below USEPA and Mississippi State Water Criteria. A copper concentration in one elutriate sample was elevated by 2.3 times above USEPA and Mississippi State Water Criteria and, based on STFATE modeling, required a dilution factor of 1.55. STFATE modeling performed for Tier III SPP tests showed the dilution criteria were met within 4 hours of disposal and within the boundaries at both disposal sites. Thus, the predicted dilution that would occur during disposal operations is predicted to dilute copper concentrations to levels below USEPA recommended Water Criteria and Mississippi State Water Criteria, thereby removing copper as a prohibitive contaminant in determining whether LPC requirements were met. The Tier II model predicted that no other contaminants of concern exceeded USEPA and Mississippi State Water Criteria. Therefore, analyses of site water and elutriates indicated that sediment would most likely meet LPC requirements for ocean disposal.

4.1.2 *Sediment*

Sediments from the Port of Gulfport Turning Basin were analyzed for physical and chemical parameters. Grain size distribution varied by DU and fell into two major groups. Grain size at four of the DUs was predominated by a mix of fines (silt and clay) and sand, while grain size at the remaining six DUs was predominated by fines. Grain size at the reference (ODMDS) locations consisted of a high percentage of fines. It is important to note that TOC was low in all Gulfport Turning Basin project sediment (less than 0.8 percent) and reference site sediments (0.9 to 1.4 percent), as these values were believed to contribute to reduced survival in some of the biological tests. Physical analyses showed Gulfport sediments were similar to reference sediments.

Metals were detected at all ten DUs and both references at concentrations below their respective ERM values. Only two PAHs were detected above ERM values at one station, and

one PAH was detected above the ERM value at one reference. TPHs, pesticides, organometallic compounds, and SVOCs were either not detected at a level of concern or not detected at all in the samples from the Gulfport Turning Basin and reference locations. Chemical analyses showed Gulfport sediments and reference sediments were similar and generally lacking in contaminants of concern.

4.2 Bioassay Testing

Bioassay testing consisted of SP tests with two species and SPP tests with three species. Sediment from Gulfport Turning Basin DUs and reference sites consisted of low TOC concentrations. Survival in the SP polychaete test was high. Survival in the initial SP amphipod test was consistently low in all sediments from the Gulfport Turning Basin and it was hypothesized that the low TOC concentrations of the material confounded the test results. After approval from the USEPA, a modified SP amphipod test (inclusion of a feeding regime) was conducted that resulted in high survival of amphipods in all re-tested sediments.

Survival in the mysid shrimp SPP test met the LPC requirements for ocean disposal. The echinoderm SPP test showed statistically significant reduced normal development in elutriate concentrations from four DUs, and the juvenile fish SPP test showed reduced survival in two DUs. Per SERIM guidance, STFATE modeling was conducted using sediment characteristics from the DU that exhibited the greatest effect relative to controls to determine ocean disposal suitability. Results of STFATE modeling indicated sediment from those DUs would be suitable for ocean disposal at either ODMDS.

Results of the SP and SPP bioassays and corresponding STFATE modeling indicated that sediments from the Gulfport Turning Basin were not acutely toxic to aquatic life and met the LPC requirements for ocean disposal. In addition, SP results suggested that both ODMDS would be suitable disposal options for Gulfport Turning Basin sediments.

4.3 Bioaccumulation Testing and Chemical Analysis of Tissue Residues

BP testing was conducted using two species. It is believed that the physical characteristics and low TOC concentrations in sediments contributed to low survivorship of bioaccumulation organisms. Reduced survival observed in some of the Gulfport Turning

Basin sediments and one reference (RS-GP-C) tested in the BP tests is believed to be attributed to the unfavorable physical characteristics and lack of food in the sediments. Many organisms were observed on top of the sediment surface during the tests, apparently unable to burrow into the sediment. These benthic organisms prefer to be buried, and being exposed may have caused them undue stress. Also, it is likely these organisms had insufficient food to sustain them through the 28-day test period.

Although survival in some sediments in the BP tests did not meet the survival criteria of 75 percent, there was sufficient tissue for chemical analyses. Contaminants of concern measured in tissues were compared to USFDA action levels for poisonous or deleterious substances in fish and shellfish for human consumption. These comparisons indicated that no contaminants of concern in Gulfport Turning Basin sediments were present at concentrations statistically greater than USFDA action levels. In addition, tissue burdens from Gulfport Turning Basin sediments were compared to reference tissue burdens, and no contaminants of concern present in Gulfport Turning Basin sediments were statistically greater than those measured in reference tissue burdens.

Based on BP testing and chemical analyses of tissues, sediment from the Gulfport Turning Basin met BP LPC requirements for ocean disposal, and both ODMDs were considered viable disposal locations.

4.4 Disposal Site Selection

Two ODMDs were identified as options for placement of sediments dredged from the Gulfport Turning Basin: Gulfport Western (RS-GP) and Pascagoula (RS-PAS). Sediment from each ODMD (reference sites) was collected and tested for physical, chemical, and biological parameters along with sediment from the ten DUs to be dredged. To select the most appropriate disposal site, physical, and chemical data collected at ODMDs sites were compared to data collected at the DUs, and each ODMD was evaluated based on their performance in toxicity tests.

4.4.1 *Sediment Physical and Chemical Data*

Conventional parameters and contaminants of concern were similar between the disposal sites and DUs. Grain size at both ODMDS consisted of a high percentage of fines. Few contaminants of concern were present in either ODMDS sediment. Therefore, based on conventional parameters, grain size, and chemical constituents of concern, both ODMDS were determined to be suitable disposal options for Gulfport Turning Basin sediments.

4.4.2 *Biological and Tissue Chemical Data*

4.4.2.1 *Gulfport Western ODMDS (RS-GP)*

Reference survival in both SP tests was high and met the reference acceptability criteria. Survival in the bivalve bioaccumulation met the reference acceptability criteria, while survival in the polychaete bioaccumulation test did not. It is believed that low TOC concentrations in sediment provided insufficient food to sustain organisms through the test period. Adequate tissue was available for chemical analyses. Tissue chemistry showed minimal contaminants of concern, and those present were measured at similar concentrations compared to Gulfport Turning Basin sediments. Therefore, based on biological and tissue chemical data, Gulfport Western ODMDS was determined to be an appropriate disposal site.

4.4.2.2 *Pascagoula ODMDS (RS-PAS)*

Survival in the polychaete test was high. Although, survival in the initial SP amphipod test did not meet the reference acceptability criteria, results from the test rerun with a feeding regime significantly increased survival in all Gulfport Turning Basin sediments that originally had low survivorship. Therefore, results were extrapolated to include RS-PAS-A. Survival in the bioaccumulation tests met the reference acceptability criteria. Tissue chemistry showed minimal contaminants of concern, and those present were measured at similar concentrations compared to Gulfport Turning Basin sediments. Therefore, based on biological and tissue chemical data, Pascagoula ODMDS was determined to be an appropriate disposal site.

4.4.2.3 *Recommendation*

Physical, chemical, and biological data indicated that either ODMDS would be a suitable placement option for dredged material from the Gulfport Turning Basin.

5 CONCLUSIONS

Physical, chemical, and biological analyses were conducted to evaluate suitability of proposed dredged material from the Port of Gulfport Turning Basin for ocean placement at one of two ODMDS (Gulfport Western or Pascagoula). The results of the Tier III biological analyses were primarily used to make suitability determinations. Results of physical and chemical analyses were used as a secondary line of evidence to reinforce biological results. In general, a lack of contaminants of concern were found in site water, elutriates, and sediment, and biological tests showed no toxicity attributable to chemicals generated from exposure to elutriates and sediment. Based on the results of these analyses, all ten DUs met LPC requirements and are therefore recommended for ocean placement at either disposal site (Table 29).

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TABLES

Table 1
Station Coordinates, Mudline Elevation, Penetration Depth, and Core Retrieval

Station ID	WGS 1984 Coordinates		Mississippi State Plane Coordinates		Mudline Elevation (feet MLLW)	Estimated Penetration Depth (feet)	Retrieved Core Length ¹ (inches)	Comments
	Longitude	Latitude	Easting	Northing				
GP-DU1-01	-89 05 09.9	30 20 54.8	904527.22	308677.69	20.7	19.0	51.0	
GP-DU1-02	-89 05 00.0	30 20 55.0	905394.69	308695.97	18.0	22.0	42.0	
GP-DU1-03	-89 05 06.1	30 20 50.4	904859.18	308232.43	19.3	21.0	29.0	
GP-DU2-01	-89 04 58.8	30 20 51.3	905499.01	308321.94	17.5	23.0	24.0	
GP-DU2-02	-89 04 54.6	30 20 50.5	905866.84	308240.31	12.5	28.0	37.0	
GP-DU2-03	-89 04 56.8	30 20 48.1	905673.54	307998.27	12.0	28.0	41.0	
GP-DU3-01	-89 05 03.4	30 20 45.0	905094.55	307686.37	10.4	30.0	36.0	
GP-DU3-02	-89 05 01.8	30 20 49.2	905235.68	308110.37	18.5	22.0	33.0	
GP-DU3-03	-89 04 58.5	30 20 46.1	905524.14	307796.55	11.7	28.0	44.0	
GP-DU4-01	-89 04 52.5	30 20 43.7	906049.34	307552.94	11.5	29.0	39.0	
GP-DU4-02	-89 04 53.3	30 20 46.7	905979.90	307856.17	11.1	29.0	40.0	
GP-DU4-03	-89 04 50.3	30 20 45.8	906242.57	307764.67	11.5	29.0	40.5	
GP-DU5-01	-89 05 00.4	30 20 42.0	905356.75	307382.72	10.6	29.0	41.0	
GP-DU5-02	-89 04 56.6	30 20 41.0	905689.49	307280.96	10.6	29.0	33.0	
GP-DU5-03	-89 04 56.7	30 20 44.0	905681.39	307584.05	10.3	30.0	44.0	
GP-DU6-01	-89 04 50.5	30 20 42.3	906224.27	307411.12	10.3	30.0	34.0	
GP-DU6-02	-89 04 49.8	30 20 38.5	906284.77	307027.09	11.3	29.0	35.0	
GP-DU6-03	-89 04 47.2	30 20 41.9	906513.34	307370.08	13.9	26.0	36.0	Pushed 0-21 feet, hammered 21-29 feet
GP-DU7-01	-89 04 55.8	30 20 37.9	905758.90	306967.63	10.0	30.0	41.5	
GP-DU7-02	-89 04 53.5	30 20 37.0	905960.23	306876.26	11.6	28.0	32.0	
GP-DU7-03	-89 04 53.1	30 20 40.0	905995.95	307179.26	10.7	29.0	46.0	
GP-DU8-01	-89 04 48.0	30 20 36.9	906442.14	306865.11	11.1	29.0	47.5	Pushed 0-26 feet, hammered 26-29 feet
GP-DU8-02	-89 04 43.9	30 20 35.2	906801.03	306692.58	11.1	29.0	42.0	
GP-DU8-03	-89 04 44.8	30 20 39.0	906723.00	307076.65	10.7	29.0	34.0	
GP-DU9-01	-89 04 53.5	30 20 33.7	905959.50	306542.88	10.9	29.0	32.0	
GP-DU9-02	-89 04 48.9	30 20 33.5	906362.53	306521.79	11.0	29.0	35.0	
GP-DU9-03	-89 04 49.7	30 20 35.7	906292.92	306744.20	11.9	28.0	39.0	
GP-DU10-01	-89 04 42.9	30 20 32.7	906888.11	306439.83	11.2	28.8	39.0	Pushed 0-21 feet, hammered 21-29 feet
GP-DU10-02	-89 04 41.2	30 20 34.3	907037.42	306601.15	11.7	28.3	40.0	Pushed 0-21 feet, hammered 21-28 feet
GP-DU10-03	-89 04 38.0	30 20 31.5	907317.20	306317.68	10.3	30.0	42.0	
RS-GP-C	-88 50 48.9	30 05 59.7	979956.29	218163.47	NA	NA	NA	
RS-PAS-A	-88 45 5.94	30 11 7.74	1010059.43	249291.18	NA	NA	NA	

Notes:

1. average of each 5' section of core

ID = identification

MLLW = mean lower low water

NA = not applicable. Samples were surface sediment, not cores.

WGS = World Geodetic System

Table 2
Recommended Analytical Parameters, Methods, and Target Detection Limits
for Site Water and Elutriate Samples

Analyzed Parameter	Recommended Analytical Method	Units	Target Detection Limit
Metals			
Arsenic	USEPA 200.8 or 6020	µg/L	1
Cadmium	USEPA 200.8 or 6020	µg/L	1
Chromium, Total ¹	USEPA 200.8 or 6020	µg/L	1
Chromium, Hexavalent (Cr+6)	USEPA 7196A	µg/L	1
Copper	USEPA 200.8 or 6020	µg/L	1
Lead	USEPA 200.8 or 6020	µg/L	1
Mercury	USEPA 245.1 or 7470	µg/L	0.2
Nickel	USEPA 200.8 or 6020	µg/L	1
Selenium	USEPA 270.2, 270.3, 7740, 7741, or 7742	µg/L	2
Silver	USEPA 200.8 or 6020	µg/L	1
Zinc	USEPA 200.8 or 6020	µg/L	1
Nonmetals			
Ammonia	USEPA 350.1	µg/L	30
Cyanide	USEPA 335.2	µg/L	10
Tributyltin	Krone et al. 1989	µg/L	0.01
Semi-Volatiles			
Pentachlorophenol	USEPA 8151 Modified or 8270C SIM	µg/L	10
Pesticides			
Aldrin	USEPA 8081	µg/L	0.5
Chlordane	USEPA 8081	µg/L	0.05
Dieldrin	USEPA 8081	µg/L	0.1
DDT	USEPA 8081	µg/L	0.5
alpha-Endosulfan	USEPA 8081	µg/L	0.03
beta-Endosulfan	USEPA 8081	µg/L	0.03
Endrin	USEPA 8081	µg/L	0.03
gamma-BHC (Lindane)	USEPA 8081	µg/L	0.1
Heptachlor	USEPA 8081	µg/L	0.05
Heptachlor Epoxide	USEPA 8081	µg/L	0.05
Toxaphene	USEPA 8081	µg/L	0.2

Notes:

¹ If hexavalent chromium (Cr+6) cannot be analyzed within holding time, total chromium will be run in its place.

µg/L - microgram per liter

SIM - selective ion monitoring

Table 3**Summary of Biological Testing for Gulfport Turning Basin**

Parameter	SP Tests	SPP Tests	BP Tests
Test Species	Amphipod <i>L. plumulosus</i> , Polychaete <i>Neanthes arenaceodentata</i>	Sea Urchin Larvae <i>Arbacia punctulata</i> , Mysid Shrimp <i>A. bahia</i> , Fish <i>M. beryllina</i>	Bivalve <i>M. nasuta</i> , Polychaete <i>N. virens</i>
Reference Sediment	SERIM RS-GP-C and RS-PAS-A reference sites	N/A	SERIM RS-GP-C and RS-PAS-A reference sites
Control	Clean sediment provided by the organism supplier	Natural or artificial seawater, and site water	Clean sediment provided by the organism supplier
Reference Toxicant Test	Yes	Yes	N/A

Notes:

N/A - not applicable

Table 4
Toxicity Test Experimental Design and Water Quality Form - *Leptocheirus plumulosus*

Toxicity Test Experimental Design and Water Quality Measurements		
Sample Identification	RS-PAS-A, RS-GP-C, GP-DU1, GP-DU2, GP-DU3, GP-DU4, GP-DU5, GP-DU6, GP-DU7, GP-DU8, GP-DU9, GP-DU10	
Dates sampled	November 24 - December 1, 2012	
Date received at lab	November 30 and December 3, 2012	
Approximate volume received	≈ 22 - 24 L per sample	
Sample storage conditions	4 ± 2°C	
Test Species	<i>Leptocheirus plumulosus</i>	
Supplier	Chesapeake Cultures in Hayes, Virginia	
Date acquired	December 6, 2012	
Acclimation/holding time	5 and 7 days for Group 1 and Group 2, respectively	
Age class	2 - 4 mm	
Test Procedures	SERIM (USEPA Region IV/USACE SAD 2008)	
Test location	TRAC Laboratories in Pensacola, Florida	
Test type/duration	Solid Phase / 10-day	
Test dates	December 11 - 21, 2012 (Group 1); December 13 - 23, 2012 (Group 2)	
Control water	Artificial seawater prepared at 20 ppt using Crystal Sea® marine salt mix and deionized water	
Test temperature	Recommended: 25 ± 1°C	Actual: 24.1 - 25.7 °C
Test salinity	Recommended: 20 ± 2 ppt	Actual: 20 - 21 ppt
Test dissolved oxygen	Recommended: ≥ 60%	Actual: 7.0 - 7.4 mg/L
Test pH	Recommended: 7.8 ± 0.5	Actual: 7.9 - 8.3
Test total ammonia	Recommended: <NOEC ¹	Actual: < 0.10 - 0.66
Test unionized ammonia	Recommended: <NOEC ¹	Actual: Not calculated ²
Test photoperiod	Continuous light	
Test chamber	1 L glass jar	
Replicates/SPP concentration/treatment	5 replicates / treatment	
SPP concentrations	N/A	
Organisms/replicate	Recommended: 20	Zero-Time Range: 20
Exposure volume	2 cm sediment / 750 mL overlying water	
Feeding	None	
Water renewal	None	
Deviations from Test Protocol: Mean survival in the Pascagoula reference sample did not meet the minimum reference survival criteria of 73% (USEPA Region IV/USACE SAD 2008). Results were compared to the Gulfport reference sample to determine suitability for ocean disposal.		

Notes:

1 NOEC (No-Observed-Effect Concentration): The highest concentration of an effluent or toxicant that causes no observable adverse effects on the test organisms (USEPA 2000).

2 Un-ionized ammonia not calculated. Total ammonia in porewater well below a level of concern.

°C = degrees Celsius

cm = centimeter

L = liter

mg/L = milligrams per liter

mL = milliliter

mm = millimeter

N/A = not applicable

ppt = parts per thousand

SAD = South Atlantic Division

SPP = suspended particulate phase

USACE = U.S. Army Corps of Engineers

USEPA = U.S. Environmental Protection Agency

Table 5
Toxicity Test Experimental Design and Water Quality Form - *Leptocheirus plumulosus* Re-test

Toxicity Test Experimental Design and Water Quality Measurements		
Sample Identification	GP-DU1, GP-DU4, GP-DU8, GP-DU10	
Dates sampled	November 24 to December 1, 2012	
Date received at lab	December 3, 1012 and January 17, 2013	
Approximate volume received	22 to 24 L per sample	
Sample storage conditions	4 ± 2°C	
Test Species	<i>Leptocheirus plumulosus</i>	
Supplier	Chesapeake Cultures in Hayes, Virginia	
Date acquired	January 18, 2013	
Acclimation/holding time	3 days	
Age class	2 - 4 mm	
Test Procedures	SERIM (USEPA Region IV/USACE SAD 2008)	
Test location	TRAC Laboratories in Pensacola, Florida	
Test type/duration	Solid phase / 10-day	
Test dates	January 21 to 31, 2013	
Control water	Artificial seawater prepared at 20 ppt using Crystal Sea® marine salt mix and deionized water	
Test temperature	Recommended: 25 ± 1°C	Actual: 24.5 - 25.8 °C
Test salinity	Recommended: 20 ± 2 ppt	Actual: 20 - 21 ppt
Test dissolved oxygen	Recommended: ≥ 60%	Actual: 7.0 - 7.3 mg
Test pH	Recommended: 7.8 ± 0.5	Actual: 7.9 - 8.3
Test total ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test unionized ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test photoperiod	Continuous light	
Test chamber	1 L glass jar	
Replicates/SPP concentration/treatment	5 replicates / treatment	
SPP concentrations	N/A	
Organisms/replicate	Recommended: 20	Zero-Time Range: 20
Exposure volume	2 cm sediment / 750 mL overlying water	
Feeding	40 mg crushed Tetramin at initiation and on day 5	
Water renewal	None	
Deviations from Test Protocol: After a review of the initial SP 10-day amphipod survival test and discussions with USEPA Region IV, additional SP 10-day amphipod tests were conducted using modified testing procedures to include a feeding schedule. The feeding regime was based on the 28-day <i>L. plumulosus</i> chronic test procedures (USEPA 2001) and consistent with those used in the Casotte Landing study (Weston Solutions 2006).		

Notes:

1 NOEC (No-Observed-Effect Concentration): The highest concentration of an effluent or toxicant that causes no observable adverse effects on the test organisms (USEPA 2000).

2 Total ammonia concentrations during initial amphipod test well below a level of concern.

°C = degrees Celsius

L = liter

mg = milligrams

mg/L = milligrams per liter

mL = milliliter

mm = millimeter

N/A = not applicable

ppt = parts per thousand

SAD = South Atlantic Division

SP = solid phase

SPP = suspended particulate phase

USACE = U.S. Army Corps of Engineers

USEPA = U.S. Environmental Protection Agency

Table 6
Toxicity Test Experimental Design and Water Quality Form - *Neanthes arenaceodentata*

Toxicity Test Experimental Design and Water Quality Measurements		
Sample Identification	RS-PAS-A, RS-GP-C, GP-DU1, GP-DU2, GP-DU3, GP-DU4, GP-DU5, GP-DU6, GP-DU7, GP-DU8, GP-DU9, GP-DU10	
Dates sampled	November 24 to December 1, 2012	
Date received at lab	November 30 and December 3, 2012	
Approximate volume received	22 to 24 L per sample	
Sample storage conditions	4 ± 2°C	
Test Species	Neanthes arenaceodentata	
Supplier	Aquatic Toxicology Support in Bremerton, Washington	
Date acquired	December 6, 2012	
Acclimation/holding time	5 and 7 days for Group 1 and Group 2, respectively	
Age class	18 and 20 days post emergence	
Test Procedures	SERIM (USEPA Region IV/USACE SAD 2008)	
Test location	TRAC Laboratories in Pensacola, Florida	
Test type/duration	Solid Phase / 10-day	
Test dates	December 11 to 21, 2012 (Group 1); December 13 to 23, 2012 (Group 2)	
Control water	Artificial seawater prepared at 30 ppt using Crystal Sea® marine salt mix and deionized water	
Test temperature	Recommended: 20 ± 1°C	Actual: 19.4 - 20.4 °C
Test salinity	Recommended: 30 ± 2 ppt	Actual: 30 - 31 ppt
Test dissolved oxygen	Recommended: ≥ 60%	Actual: 7.0 - 7.6 mg/L
Test pH	Recommended: 7.8 ± 0.5	Actual: 8.0 - 8.3
Test total ammonia	Recommended: <NOEC ¹	Actual: <0.10 to 0.22
Test unionized ammonia	Recommended: <NOEC ¹	Actual: Not calculated ²
Test photoperiod	16-hour light / 8-hour dark	
Test chamber	1 L glass jar	
Replicates/SPP concentration/treatment	5 replicates / treatment	
SPP concentrations	N/A	
Organisms/replicate	Recommended: 5 - 10	Zero-Time Range: 10
Exposure volume	2 cm sediment / 750 mL overlying water	
Feeding	None	
Water renewal	None	
Deviations from Test Protocol: The LC ₅₀ for the reference toxicant test was slightly outside the upper control limit. Control limits are expected to be exceeded in approximately 5% of tests (USEPA 2002). In addition, very narrow control limits were developed for this species due to a lack of partial mortalities bracketing the estimated LC50 concentrations, resulting in identical LC50 values for multiple tests. This deviation is not believed to affect the overall interpretation of test results.		

Notes:

1 NOEC (No-Observed-Effect Concentration): The highest concentration of an effluent or toxicant that causes no observable adverse effects on the test organisms (USEPA 2000).

2 Un-ionized ammonia not calculated. Total ammonia in porewater well below a level of concern.

°C = degrees Celsius

cm = centimeter

L = liter

mg/L = milligrams per liter

mL = milliliter

N/A = not applicable

ppt = parts per thousand

SAD = South Atlantic Division

SPP = suspended particulate phase

USACE = U.S. Army Corps of Engineers

USEPA = U.S. Environmental Protection Agency

Table 7
Toxicity Test Experimental Design and Water Quality Form - *Arbacia punctulata*

Toxicity Test Experimental Design and Water Quality Measurements		
Sample Identification	GP-DU1, GP-DU2, GP-DU3, GP-DU4, GP-DU5, GP-DU6, GP-DU7, GP-DU8, GP-DU9, GP-DU10	
Dates sampled	November 24 to December 1, 2012	
Date received at lab	November 30 and December 3, 2012	
Approximate volume received	22 to 24 L per sample	
Sample storage conditions	4 ± 2°C	
Test Species	<i>Arbacia punctulata</i>	
Supplier	Gulf Speciment Marine Laboratories Inc., in Panacea, Florida	
Date acquired	December 10, 2012	
Acclimation/holding time	1 day	
Age class	Spawning adults	
Test Procedures	SERIM (USEPA Region IV/USACE SAD 2008)	
Test location	TRAC Laboratories in Pensacola, Florida	
Test type/duration	Suspended Particulate Phase / 48-hour	
Test dates	December 11 to 13, 2012	
Control water	Artificial seawater prepared at 30 ppt using Crystal Sea® marine salt mix and deionized water	
Test temperature	Recommended: 20 ± 1°C	Actual: 19.1 - 20.8°C
Test salinity	Recommended: 30 ± 2 ppt	Actual: 30 ppt
Test dissolved oxygen	Recommended: ≥ 60%	Actual: 7.1 - 8.0 mg
Test pH	Recommended: 7.8 ± 0.5	Actual: 8.0 - 8.4
Test total ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test unionized ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test photoperiod	16-hour light / 8-hour dark	
Test chamber	30 mL glass vial	
Replicates/SPP concentration/treatment	5 replicates / treatment	
SPP concentrations	1, 10, 50, and 100%	
Organisms/replicate	Recommended: 15 to 30/mL	Zero-Time Range: 200 embryos
Exposure volume	10 mL	
Feeding	None	
Water renewal	None	
Deviations from Test Protocol: The pH of sample GP-DU6 was slightly outside the optimal range presented in the SERIM (7.8 ± 0.5; USEPA Region IV/USACE SAD 2008). This minor deviation is not expected to affect the overall results.		

Notes:

1 NOEC (No-Observed-Effect Concentration): The highest concentration of an effluent or toxicant that causes no observable adverse effects on the test organisms (EPA 2000).

2 Total ammonia concentrations in sample porewater well below a level of concern.

°C = degrees Celsius

L = liter

mg = milligrams

mL = milliliter

ppt = parts per thousand

SAD = South Atlantic Division

SPP = suspended particulate phase

USACE = U.S. Army Corps of Engineers

USEPA = U.S. Environmental Protection Agency

Table 8
Toxicity Test Experimental Design and Water Quality Form - *Americamysis bahia*

Toxicity Test Experimental Design and Water Quality Measurements		
Sample Identification	GP-DU1, GP-DU2, GP-DU3, GP-DU4, GP-DU5, GP-DU6, GP-DU7, GP-DU8, GP-DU9, GP-DU10	
Dates sampled	November 24 to December 1, 2012	
Date received at lab	November 30 and December 3, 2012	
Approximate volume received	22 to 24 L per sample	
Sample storage conditions	4 ± 2°C	
Test Species	<i>Americamysis bahia</i>	
Supplier	Aquatic Bio Systems Inc., in Fort Collins, Colorado	
Date acquired	December 11, 2012	
Acclimation/holding time	1 day	
Age class	3 days old	
Test Procedures	SERIM (USEPA Region IV/USACE SAD 2008)	
Test location	TRAC Laboratories in Pensacola, Florida	
Test type/duration	Suspended Particulate Phase / 96-hour	
Test dates	December 12 to 16, 2012	
Control water	Artificial seawater prepared at 30 ppt using Crystal Sea® marine salt mix and deionized water	
Test temperature	Recommended: 20 ± 1°C	Actual: 19.0 - 20.8 °C
Test salinity	Recommended: 30 ± 2 ppt	Actual: 30 ppt
Test dissolved oxygen	Recommended: ≥ 60%	Actual: 6.7 - 8.0 mg
Test pH	Recommended: 7.8 ± 0.5	Actual: 7.9 - 8.4
Test total ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test unionized ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test photoperiod	16-hour light / 8-hour dark	
Test chamber	500 mL plastic	
Replicates/SPP concentration/treatment	5 replicates / treatment	
SPP concentrations	10, 50, and 100%	
Organisms/replicate	Recommended: 10	Zero-Time Range: 10
Exposure volume	200 mL	
Feeding	<i>Artemia</i> nauplii prior to test and 0.2 mL of concentrated suspension daily	
Water renewal	None	
Deviations from Test Protocol: The pH of sample GP-DU6 was slightly outside the optimal range presented in the SERIM (7.8 ± 0.5; USEPA Region IV/USACE SAD 2008). This minor deviation is not expected to affect the overall results.		

Notes:

1 NOEC (No-Observed-Effect Concentration): The highest concentration of an effluent or toxicant that causes no observable adverse effects on the test organisms (EPA 2000).

2 Total ammonia concentrations in sample porewater well below a level of concern.

°C = degrees Celsius

L = liter

mg = milligrams

mL = milliliter

NOEC = no observed effect concentration

ppt = parts per thousand

SAD = South Atlantic Division

SPP = suspended particulate phase

USACE = U.S. Army Corps of Engineers

USEPA = U.S. Environmental Protection Agency

Table 9
Toxicity Test Experimental Design and Water Quality Form - *Menidia beryllina*

Toxicity Test Experimental Design and Water Quality Measurements		
Sample Identification	GP-DU1, GP-DU2, GP-DU3, GP-DU4, GP-DU5, GP-DU6, GP-DU7, GP-DU8, GP-DU9, GP-DU10	
Dates sampled	November 24 to December 1, 2012	
Date received at lab	November 30 and December 3, 2012	
Approximate volume received	22 to 24 L per sample	
Sample storage conditions	4 ± 2°C	
Test Species	Menidia beryllina	
Supplier	Aquatic Bio Systems Inc., in Fort Collins, Colorado	
Date acquired	December 11, 2012	
Acclimation/holding time	1 day	
Age class	9 days old	
Test Procedures	SERIM (USEPA Region IV/USACE SAD 2008)	
Test location	TRAC Laboratories in Pensacola, Florida	
Test type/duration	Suspended Particulate Phase / 96-hour	
Test dates	December 12 to 16, 2012	
Control water	Artificial seawater prepared at 30 ppt using Crystal Sea® marine salt mix and deionized water	
Test temperature	Recommended: 20 ± 1°C	Actual: 19.0 - 20.8 °C
Test salinity	Recommended: 30 ± 2 ppt	Actual: 30 ppt
Test dissolved oxygen	Recommended: ≥ 60%	Actual: 6.9 - 8.0 mg
Test pH	Recommended: 7.8 ± 0.5	Actual: 8.0 - 8.4
Test total ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test unionized ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test photoperiod	16-hour light / 8-hour dark	
Test chamber	500 mL plastic	
Replicates/SPP concentration/treatment	5 replicates / treatment	
SPP concentrations	10, 50, and 100%	
Organisms/replicate	Recommended: 10	Zero-Time Range: 10
Exposure volume	200 mL	
Feeding	Artemia nauplii prior to test and 0.2 mL of concentrated suspension at 48 hours	
Water renewal	None	
Deviations from Test Protocol: The pH of sample GP-DU6 was slightly outside the optimal range presented in the SERIM (7.8 ± 0.5; USEPA Region IV/USACE SAD 2008). This minor deviation is not expected to affect the overall results.		

Notes:

1 NOEC (No-Observed-Effect Concentration): The highest concentration of an effluent or toxicant that causes no observable adverse effects on the test organisms (EPA 2000).

2 Total ammonia concentrations in sample porewater well below a level of concern.

°C = degrees Celsius

L = liter

mg = milligrams

mL = milliliter

ppt = parts per thousand

SAD = South Atlantic Division

SPP = suspended particulate phase

USACE = U.S. Army Corps of Engineers

USEPA = U.S. Environmental Protection Agency

Table 10
Toxicity Test Experimental Design and Water Quality Form - *Nereis virens*

Toxicity Test Experimental Design and Water Quality Measurements		
Sample Identification	RS-PAS-A, RS-GP-C, GP-DU1, GP-DU2, GP-DU3, GP-DU4, GP-DU5, GP-DU6, GP-DU7, GP-DU8, GP-DU9, GP-DU10	
Dates sampled	November 24 to December 1, 2012	
Date received at lab	November 30 and December 3, 2012	
Approximate volume received	22 to 24 L per sample	
Sample storage conditions	4 ± 2°C	
Test Species	<i>Nereis virens</i>	
Supplier	Aquatic Research Organisms in Hampton, New Hapshire	
Date acquired	January 4, 2013	
Acclimation/holding time	3 days	
Age class	Mature adult	
Test Procedures	SERIM (USEPA Region IV/USACE SAD 2008)	
Test location	TRAC Laboratories in Pensacola, Florida	
Test type/duration	Bioaccumulation Potential / 28-day	
Test dates	January 7 to February 5, 2013	
Control water	Natural seawater and deionized water at 30 ppt	
Test temperature	Recommended: 10 ± 5°C	Actual: 13.0 - 15.0°C
Test salinity	Recommended: 30 ± 2 ppt	Actual: 30 - 32 ppt
Test dissolved oxygen	Recommended: ≥ 60%	Actual: 7.0 - 8.1 mg/L
Test pH	Recommended: 7.8 ± 0.5	Actual: 7.8 - 8.3
Test total ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test unionized ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test photoperiod	12-hour light / 12-hour dark	
Test chamber	40 L HDPE subdivided aquaria	
Replicates/SPP concentration/treatment	5 replicates / treatment	
SPP concentrations	N/A	
Organisms/replicate	Recommended: Depends on subsequent analysis	Zero-Time Range: 5
Exposure volume	2 L sediment / 28 L control water	
Feeding	None	
Water renewal	Every other day	
Deviations from Test Protocol: Mean survival in the Gulfport reference sample did not meet the minimum reference survival criteria of 90 percent (USEPA Region IV/USACE SAD 2008). Survival in two samples (GP-DU7 and GP-DU10) did not meet the minimum test treatment survival criteria of 75 percent. Sufficient tissue mass was available at test completion for all of the required chemical analyses, with the exception of three replicates from GP-DU10. USEPA Region IV was notified of deviation on February 13, 2013.		

Notes:

1 NOEC (No-Observed-Effect Concentration): The highest concentration of an effluent or toxicant that causes no observable adverse effects on the test organisms (EPA 2000).

2 Total ammonia concentrations in sample porewater well below a level of concern.

°C = degrees Celsius

HDPE = high-density polyethylene

L = liter

mg/L = milligrams per liter

N/A = not applicable

ppt = parts per thousand

SAD = South Atlantic Division

SPP = suspended particulate phase

USACE = U.S. Army Corps of Engineers

USEPA = U.S. Environmental Protection Agency

Table 11
Toxicity Test Experimental Design and Water Quality Form - *Macoma nasuta*

Toxicity Test Experimental Design and Water Quality Measurements		
Sample Identification	RS-PAS-A, RS-GP-C, GP-DU1, GP-DU2, GP-DU3, GP-DU4, GP-DU5, GP-DU6, GP-DU7, GP-DU8, GP-DU9, GP-DU10	
Dates sampled	November 24 to December 1, 2012	
Date received at lab	November 30 and December 3, 2012	
Approximate volume received	22 to 24 L per sample	
Sample storage conditions	4 ± 2°C	
Test Species	Macoma nasuta	
Supplier	Aquatic Research Organisms in Hampton, New Hapshire	
Date acquired	January 4, 2013	
Acclimation/holding time	3 days	
Age class	Mature adult	
Test Procedures	SERIM (USEPA Region IV/USACE SAD 2008)	
Test location	TRAC Laboratories in Pensacola, Florida	
Test type/duration	Bioaccumulation Potential / 28-day	
Test dates	January 7 to February 5, 2013	
Control water	Natural seawater and deionized water at 30 ppt	
Test temperature	Recommended: 12 - 16 ± 1°C	Actual: 13.0 - 15.0°C
Test salinity	Recommended: 30 ± 2 ppt	Actual: 30 - 32 ppt
Test dissolved oxygen	Recommended: ≥ 60%	Actual: 7.0 - 8.3 mg/L
Test pH	Recommended: 7.8 ± 0.5	Actual: 7.8 - 8.3
Test total ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test unionized ammonia	Recommended: <NOEC ¹	Actual: Not measured ²
Test photoperiod	12-hour light / 12-hour dark	
Test chamber	40 L HDPE subdivided aquaria	
Replicates/SPP concentration/treatment	5 replicates / treatment	
SPP concentrations	N/A	
Organisms/replicate	Recommended: Depends on subsequent analysis	Zero-Time Range: 8
Exposure volume	2 L sediment / 28 L control water	
Feeding	None	
Water renewal	Every other day	
Deviations from Test Protocol: Survival in two samples (GP-DU1 and GP-DU4) did not meet the minimum test treatment survival criteria of 75 percent (USEPA Region IV/USACE SAD 2008); however, sufficient tissue mass was available at test completion for all of the required chemical analyses.		

Notes:

1 NOEC (No-Observed-Effect Concentration): The highest concentration of an effluent or toxicant that causes no observable adverse effects on the test organisms (EPA 2000).

2 Total ammonia concentrations in sample porewater well below a level of concern.

°C = degrees Celsius

HDPE - high-density polyethylene

L = liter

mg/L = milligrams per liter

N/A = not applicable

ppt = parts per thousand

SAD = South Atlantic Division

SPP = suspended particulate phase

USACE = U.S. Army Corps of Engineers

USEPA = U.S. Environmental Protection Agency


Table 12

Final Validated Data - Elutriate and Site Water Chemistry Results

FINAL VALIDATED DATA	Location ID	GP-DU1-COMP	GP-DU2-COMP	GP-DU3-COMP	GP-DU4-COMP	GP-DU5-COMP	GP-DU6-COMP	GP-DU7-COMP	GP-DU8-COMP	GP-DU9-COMP	GP-DU10-COMP	GP-SW-1
	Sample ID	GP-DU1-COMP	GP-DU2-COMP	GP-DU3-COMP	GP-DU4-COMP	GP-DU5-COMP	GP-DU6-COMP	GP-DU7-COMP	GP-DU8-COMP	GP-DU9-COMP	GP-DU10-COMP	GP-SW-1
	Sample Date	12/1/2012	11/30/2012	11/30/2012	11/29/2012	11/28/2012	11/27/2012	11/28/2012	11/26/2012	11/25/2012	11/24/2012	11/28/2012
	Sample Type	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Site Water
	USEPA Water Quality Criteria for Aquatic Life and Numeric Criteria for Mississippi State Waters											
Conventional Parameters (mg/L)												
Ammonia	pH and temperature dependent	16	11	9.1	5.8	5.6	8.5	8.7	9	7.9	6.2	0.024 U
Cyanide, total	1	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U
Metals (µg/L)												
Arsenic	--	36	17	17	33	47	23	20	25	23	15	2.4
Cadmium	--	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U
Chromium	--	48	6.5	17	30	52	2.9	3	2.6	2.5	2.4 J	1 J
Chromium VI	--	10 U	1.8 U	10 U	1.8 U	1.8 U	1.8 U	6.2 J	1.8 U	1.8 U	1.8 U	1.9 J
Copper	--	18	2.1 J	5.2	8.5	18	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Lead	--	34	2.9	8.6	14	28	0.82 J	0.95 J	0.79 J	0.67 J	0.6 J	0.17 U
Mercury	--	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U
Nickel	--	23	4.4	8.9	17	31	2.6	2.4 J	2.3 J	2.3 J	1.9 J	0.7 U
Selenium	--	4.2	2	3	3.3	3.5	2.9	2.2	1.9	2.2	1.7	1.3
Silver	--	0.063 U	0.063 U	0.063 U	0.063 U	0.092 J	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U
Zinc	--	100	14 J	32	59	110	14 U	14 U	14 U	14 U	14 U	14 U
Metals, Dissolved (µg/L)												
Arsenic	69	11	14	7.7	22	28	22	20	26	23	15	2.8
Cadmium	40	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U
Chromium	--	0.77 J	1.3 J	0.93 J	3.6	34	1.4 J	1.3 J	1.3 J	1.3 J	0.63 U	0.63 U
Copper	4.8	1.9 U	1.9 U	1.9 U	1.9 U	11	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Lead	210	0.53 J	0.72 J	0.53 J	2.7	18	0.31 J	0.33 J	0.31 J	0.32 J	0.17 U	0.32 J
Mercury	1.8	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U	0.083 U
Nickel	74/75 ¹	2 J	2.3 J	1.7 J	4.3	20	1.6 J	1.5 J	1.7 J	1.7 J	1 J	0.7 U
Selenium	290	1.3	4.7	1.2 J	5.2	2.1	1.8	1.5	2.3	1.7	1.8	1.9
Silver	1.9	0.063 U	0.063 U	0.063 U	0.063 U	0.21 J	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U
Zinc	90	14 U	14 U	14 U	14 J	78	14 U	14 U	14 U	14 U	14 U	14 U
Organometallic Compounds (µg/L)												
Butyltin (n-Butyltin)	--	0.55 UJ	0.68 UJ	0.61 UJ	0.51 UJ	0.53 UJ	0.49 UJ	0.53 UJ	0.53 UJ	0.47 UJ	0.52 UJ	
Dibutyltin	--	0.0093 U	0.012 U	0.01 U	0.0085 U	0.0089 U	0.0082 U	0.0089 U	0.009 U	0.0079 U	0.0087 U	
Tributyltin	--	0.013 U	0.016 U	0.015 U	0.012 U	0.013 U	0.012 U	0.013 U	0.013 U	0.011 U	0.012 U	
Semivolatile Organics (µg/L)												
Pentachlorophenol	13	0.076 UJ	0.088 UJ	0.076 UJ	0.076 UJ	0.076 UJ	0.069 U	0.07 U	0.069 U	0.069 U	0.07 U	0.56 J
Pesticides (µg/L)												
4,4'-DDD (p,p'-DDD)	--	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
4,4'-DDE (p,p'-DDE)	--	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
4,4'-DDT (p,p'-DDT)	0.13	0.029 U	0.031 U	0.03 U	0.031 U	0.033 U	0.028 UJ	0.027 UJ	0.027 UJ	0.028 UJ	0.027 UJ	0.011 U
Aldrin	1.3	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Chlordane	0.09	0.034 U	0.036 U	0.035 U	0.036 U	0.037 U	0.032 U	0.031 U	0.031 U	0.032 U	0.031 U	0.013 U
Chlordane, alpha- (cis-Chlordane)	--	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Chlordane, gamma-	--	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Dieldrin	0.71	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Endosulfan sulfate	0.034 ²	0.11 U*	0.11 U*	0.11 U*	0.11 U*	0.12 U*	0.1 U*	0.098 U*	0.097 U*	0.099 U*	0.097 U*	0.04 U*
Endosulfan-alpha (I)	0.034	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Endosulfan-beta (II)	0.034	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Endrin	0.037	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Endrin aldehyde	--	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Endrin ketone	--	0.021 U	0.022 U	0.022 U	0.022 U	0.023 U	0.02 U	0.02 U	0.019 U	0.02 U	0.019 U	0.008 U
Heptachlor	0.053	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U

Table 12
Final Validated Data - Elutriate and Site Water Chemistry Results

FINAL VALIDATED DATA	Location ID	GP-DU1-COMP	GP-DU2-COMP	GP-DU3-COMP	GP-DU4-COMP	GP-DU5-COMP	GP-DU6-COMP	GP-DU7-COMP	GP-DU8-COMP	GP-DU9-COMP	GP-DU10-COMP	GP-SW-1
	Sample ID	GP-DU1-COMP	GP-DU2-COMP	GP-DU3-COMP	GP-DU4-COMP	GP-DU5-COMP	GP-DU6-COMP	GP-DU7-COMP	GP-DU8-COMP	GP-DU9-COMP	GP-DU10-COMP	GP-SW-1
	Sample Date	12/1/2012	11/30/2012	11/30/2012	11/29/2012	11/28/2012	11/27/2012	11/28/2012	11/26/2012	11/25/2012	11/24/2012	11/28/2012
	Sample Type	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Elutriate	Site Water
	USEPA Water Quality Criteria for Aquatic Life and Numeric Criteria for Mississippi State Waters											
Heptachlor epoxide	0.053 ³	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Hexachlorocyclohexane, alpha (BHC)	--	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Hexachlorocyclohexane, beta- (BHC)	--	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Hexachlorocyclohexane, delta (BHC)	--	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Hexachlorocyclohexane, gamma- (BHC) (Lindane)	0.16	0.014 U	0.015 U	0.014 U	0.014 U	0.015 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.0052 U
Methoxychlor	--	0.071 U	0.075 U	0.073 U	0.074 U	0.078 U	0.068 UJ	0.066 UJ	0.065 UJ	0.066 UJ	0.065 UJ	0.027 U
Toxaphene	0.21	0.32 U*	0.34 U*	0.33 U*	0.33 U*	0.35 U*	0.3 U*	0.29 U*	0.29 U*	0.3 U*	0.29 U*	0.12 U
Total DDx (U = 1/2)	--	0.029 U	0.031 U	0.03 U	0.031 U	0.033 U	0.028 UJ	0.027 UJ	0.027 UJ	0.028 UJ	0.027 UJ	0.011 U
Total DDx (U = 0)	--	0.029 U	0.031 U	0.03 U	0.031 U	0.033 U	0.028 UJ	0.027 UJ	0.027 UJ	0.028 UJ	0.027 UJ	0.011 U

Notes:
 Detected concentration is greater than USEPA Water Quality Criteria for Aquatic Life and Numeric Criteria for Mississippi State Waters screening level
 * Results marked with an asterisk (*) are non-detect results that exceed the water quality criteria.

Bold = Detected result

- = not reported or not applicable
- 1 = USEPA criteria of 74, State criteria of 75
- 2 = State criteria; no USEPA criteria
- 3 = USEPA criteria; no State criteria

J = Estimated value
mg/L = milligrams per liter
U = Compound analyzed, but not detected above detection limit
UJ = Compound analyzed, but not detected above estimated detection limit
µg/L = micrograms per liter

All non-detect results are reported at the **method detection limit**.
 The method detection limit is the minimum concentration that can be measured and reported with 99 percent confidence that the concentration is greater than zero, but the exact concentration cannot be reliably quantified.
 In the sediment chemistry results table, the MDL is used instead of the RL because several compounds have RLs greater than the screening level values (e.g., ERLs) and use of the MDL illustrates that the compound is likely also non-detect at concentrations below these screening level values.
 The full analytical laboratory report in Appendix B contains the RL information.
 Totals are calculated as the sum of all detected results (U=0). If all results are not detected, the highest reporting limit value is reported as the sum.
 Totals are calculated as the sum of all detected results and half of the reporting limit of undetected results (U=1/2). If all results are not detected, the highest reporting limit value is reported as the sum.
 Total DDx consists of the sum of 4,4'-DDD, 4,4'-DDE, 4,4'-DDT 2,4'-DDD, 2,4'-DDE, and 2,4'-DDT if measured.

FINAL VALIDATED DATA

Table 13
Final Validated Data - Sediment Chemistry Results

FINAL VALIDATED DATA		Location ID Sample ID Sample Date Sample Type	GP-DU1-COMP GP-DU1-COMP 12/1/2012 Composite	GP-DU2-COMP GP-DU2-COMP 11/30/2012 Composite	GP-DU3-COMP GP-DU3-COMP 11/30/2012 Composite	GP-DU4-COMP GP-DU4-COMP 11/29/2012 Composite	GP-DU5-COMP GP-DU5-COMP 11/28/2012 Composite	GP-DU6-COMP GP-DU6-COMP 11/27/2012 Composite	GP-DU7-COMP GP-DU7-COMP 11/28/2012 Composite	GP-DU8-COMP GP-DU8-COMP 11/26/2012 Composite	GP-DU9-COMP GP-DU9-COMP 11/25/2012 Composite	GP-DU10-COMP GP-DU10-COMP 11/24/2012 Composite	GP-DU10-COMP GP-DU10-COMP-A 11/24/2012 Composite	RS-GP-C RS-GP-C 11/30/2012 Reference	RS-PAS-A RS-PAS-A 11/30/2012 Reference
	ERL	ERM													
Conventional Parameters (unitless)															
Specific gravity	--	--	1.4091	1.4531	1.514	1.3491	1.357	1.3924	1.3935	1.469	1.3817	1.5062	1.4304	1.2843	1.3097
Conventional Parameters (pct)															
Total organic carbon	--	--	0.55 J	0.45 J	0.44 J	0.72 J	0.76 J	0.62 J	0.65 J	0.68 J	0.68 J	0.63 J	--	0.9 J	1.4 J
Total solids	--	--	49	52	56	44	43	46	45	52	44	54	48	36	32
Conventional Parameters (su)															
pH	--	--	8.52	8.56	8.64	8.96	9	8.92	8.96	9.09	9.08	8.88 J	--	8.83	8.55
Grain Size (pct)															
Gravel	--	--	0	0	0	0	0	0	0	0	0	0	--	0	0
Sand	--	--	36.4	42.3	46.1	6.2	2.8	17.3	10.6	27.1	10.6	57.3	--	2.7	5.7
Silt	--	--	17.6	21.7	18.1	24.4	25.2	26.7	21.9	30.3	28	13.5	--	28.6	44.6
Clay	--	--	46	36	35.8	69.4	72	56	67.5	42.6	61.4	29.2	--	68.7	49.7
Metals (mg/kg)															
Arsenic	8.2	70	9.8	8.9	8.9	15	14	12	13	9.7	13	8.7	11	9.2	15
Cadmium	1.2	9.6	0.25 U	0.24 U	0.3 U	0.33 U	0.29 U	0.38 U	0.39 U	0.38 U	0.38 U	0.24 U	0.33 U	0.34 U	0.52 U
Chromium	81	370	22	19	20	39	41	38	39	28	38	22	31	37	47
Copper	34	270	6.8	6.6	6.1	9.8	11	9.7	11	7.9	11	6.6	9.6	22	15
Lead	46.7	218	12	10	9.7	15	16	14	15	12	17	9.7	14	18	20
Mercury	0.15	0.71	0.025	0.024	0.025	0.014 U	0.029	0.025	0.029	0.023	0.03	0.019	--	0.045	0.066
Nickel	20.9	51.6	9.1	10	9.2	18	21	18	20	15	21	12	17	30	23
Selenium	--	--	0.72	0.42 J	0.35 J	0.68 J	0.82	0.76 J	0.59 J	0.71 J	0.79 J	0.51 J	0.69 J	0.79 J	0.95 J
Silver	1	3.7	0.041 J	0.042 J	0.031 J	0.062 J	0.068 J	0.05 J	0.061 J	0.043 J	0.063 J	0.038 J	0.027 J	0.097 J	0.028 J
Zinc	150	410	41	39	35	66	74	66	70	52	72	42	62	100	93
Organometallic Compounds (µg/kg)															
Butyltin (n-Butyltin)	--	--	10 UJ	9.4 UJ	8.9 UJ	11 UJ	12 UJ	11 UJ	11 UJ	9.5 UJ	11 UJ	9.1 UJ	--	14 UJ	15 UJ
Dibutyltin	--	--	0.8 U	0.76 U	0.71 U	0.91 U	0.92 U	0.86 U	0.88 U	0.76 U	0.92 UJ	0.73 UJ	--	1.1 U	1.2 U
Tributyltin	--	--	1.3 U	1.3 U	1.2 U	1.5 U	1.5 U	1.4 U	1.5 U	1.3 U	1.5 UJ	1.2 UJ	--	1.8 U	2.1 U
Semivolatile Organics (µg/kg)															
Hexachlorobenzene	--	--	1.8 U	1.7 U	1.6 U	2 U	2.1 U	2 U	2 U	1.7 U	2 U	1.7 U	--	2.5 U	2.8 U
Pentachlorophenol	--	--	150 U	140 U	130 U	160 U	170 U	160 U	160 U	140 U	170 U	130 U	--	200 U	230 U
Polycyclic Aromatic Hydrocarbons (µg/kg)															
1-Methylnaphthalene	--	--	7 U	950	120	7.7 U	7.9 U	330	270	6.6 U	7.8 U	6.3 U	--	770	11 U
2-Methylnaphthalene	70	670	7.8 U	1600	200	8.7 U	8.8 U	580	500	7.3 U	8.7 U	7.1 U	--	1400	12 U
Acenaphthene	16	500	13 U	12 U	11 U	14 U	14 U	14 U	14 U	12 U	14 U	12 U	--	17 U*	20 U*
Acenaphthylene	44	640	7.4 U	7 U	6.5 U	8.2 U	8.4 U	7.9 U	8.1 U	6.9 U	8.3 U	6.7 U	--	10 U	11 U
Anthracene	85.3	1100	18 U	17 U	16 U	20 U	20 U	19 U	20 U	17 U	20 U	16 U	--	24 U	28 U
Benzo(a)anthracene	261	1600	8.6 U	8.1 U	7.5 U	9.6 U	9.8 U	9.2 U	9.4 U	8.1 U	9.7 U	7.8 U	--	12 U	13 U
Benzo(a)pyrene	430	1600	13 U	12 U	11 U	15 U	15 U	14 U	14 U	12 U	15 U	12 U	--	18 U	20 U
Benzo(b)fluoranthene	--	--	12 U	11 U	10 U	13 U	13 U	12 U	13 U	11 U	13 U	10 U	--	16 U	18 U
Benzo(g,h,i)perylene	--	--	10 U	9.7 U	9 U	11 U	12 U	11 U	11 U	9.6 U	11 U	9.3 U	--	14 U	16 U
Benzo(k)fluoranthene	--	--	11 U	10 U	9.3 U	12 U	12 U	11 U	12 U	10 U	12 U	9.7 U	--	14 U	16 U
Chrysene	384	2800	7.8 U	7.3 U	6.8 U	8.7 U	8.8 U	8.3 U	8.5 U	7.3 U	8.7 U	7.1 U	--	11 U	12 U
Dibenzo(a,h)anthracene	63.4	260	17 U	16 U	15 U	19 U	19 U	18 U	18 U	16 U	19 U	15 U	--	23 U	26 U
Fluoranthene	600	5100	7.4 U	7 U	6.5 U	8.2 U	8.4 U	7.9 U	8.1 U	6.9 U	8.3 U	6.7 U	--	10 U	11 U
Fluorene	19	540	12 U	11 U	10 U	13 U	13 U	12 U	13 U	11 U	13 U	10 U	--	16 U	18 U
Indeno(1,2,3-c,d)pyrene	--	--	12 U	12 U	11 U	14 U	14 U	13 U	13 U	12 U	14 U	11 U	--	17 U	19 U
Naphthalene	160	2100	14 U	2200	150	15 U	16 U	670	610	13 U	16 U	13 U	--	1600	21 U
Phenanthrene	240	1500	9.1 U	8.5 U	7.9 U	10 U	10 U	9.6 U	9.9 U	8.5 U	10 U	8.2 U	--	12 U	14 U
Pyrene	665	2600	7.4 J	6.6 U	6.1 U	7.7 U	7.9 U	7.5 U	7.6 U	6.6 U	7.8 U	6.3 U	--	9.4 U	11 U
Total HPAH (9 of 17) (U = 1/2)	--	--	56.8 J	16 U	15 U	19 U	19 U	18 U	18 U	16 U	19 U	15 U	--	23 U	26 U
Total LPAH (8 of 17) (U = 1/2)	--	--	18 U	3827.8	375.7	20 U	20 U	1281.3	1142.5	17 U	20 U	16 U	--	3039.5	28 U
Total PAH (17) (U = 1/2)	--	--	97.5 J	3877.6	421.8	20 U	20 U	1337.2	1199.8	17 U	20 U	16 U	--	3111.7	28 U
Total HPAH (9 of 17) (U = 0)	1700	9600	7.4 J	16 U	15 U	19 U	19 U	18 U	18 U	16 U	19 U	15 U	--	23 U	26 U
Total LPAH (8 of 17) (U = 0)	552	3160	18 U	3800	350	20 U	20 U	1250	1110	17 U	20 U	16 U	--	3000	28 U
Total PAH (17) (U = 0)	4022	44792	7.4 J	3800	350	20 U	20 U	1250	1110	17 U	20 U	16 U	--	3000	28 U
Pesticides (µg/kg)															
4,4'-DDD (p,p'-DDD)	2	20	0.7 U	0.66 U	0.61 U	0.77 U	0.79 U	0.75 U	0.76 U	0.66 U	0.78 U	0.63 U	--	0.94 U	1.1 U
4,4'-DDE (p,p'-DDE)	2.2	27	0.62 U	0.58 U	0.54 U	0.68 U	0.7 U	0.66 U	0.67 U	0.58 U	0.69 U	0.56 U	--	0.83 U	0.95 U
4,4'-DDT (p,p'-DDT)	1	7	1.1 UJ*	1 UJ	0.97 UJ	1.2 UJ*	1.3 UJ*	1.2 UJ*	1.2 UJ*	1 UJ	1.2 UJ*	1 UJ	--	1.5 UJ*	1.7 UJ*

Table 13
Final Validated Data - Sediment Chemistry Results

FINAL VALIDATED DATA		Location ID Sample ID Sample Date Sample Type	GP-DU1-COMP GP-DU1-COMP 12/1/2012 Composite	GP-DU2-COMP GP-DU2-COMP 11/30/2012 Composite	GP-DU3-COMP GP-DU3-COMP 11/30/2012 Composite	GP-DU4-COMP GP-DU4-COMP 11/29/2012 Composite	GP-DU5-COMP GP-DU5-COMP 11/28/2012 Composite	GP-DU6-COMP GP-DU6-COMP 11/27/2012 Composite	GP-DU7-COMP GP-DU7-COMP 11/28/2012 Composite	GP-DU8-COMP GP-DU8-COMP 11/26/2012 Composite	GP-DU9-COMP GP-DU9-COMP 11/25/2012 Composite	GP-DU10-COMP GP-DU10-COMP 11/24/2012 Composite	GP-DU10-COMP-A GP-DU10-COMP-A 11/24/2012 Composite	RS-GP-C RS-GP-C 11/30/2012 Reference	RS-PAS-A RS-PAS-A 11/30/2012 Reference
	ERL	ERM													
Aldrin	--	--	0.6 U	0.56 U	0.52 U	0.66 U	0.67 U	0.64 U	0.65 U	0.56 U	0.67 U	0.54 U	--	0.8 U	0.92 U
Chlordane	0.5	6	3.1 U*	2.9 U*	2.7 U*	3.4 U*	3.5 U*	3.3 U*	3.4 U*	2.9 U*	3.4 U*	2.8 U*	--	4.2 U*	4.7 U*
Chlordane, alpha- (cis-Chlordane)	--	--	0.88 U	0.83 U	0.77 U	0.98 U	1 U	0.94 U	0.97 U	0.83 U	0.99 U	0.8 U	--	1.2 U	1.4 U
Chlordane, gamma-	--	--	0.88 U	0.83 U	0.77 U	0.98 U	1 U	0.94 U	0.97 U	0.83 U	0.99 U	0.8 U	--	1.2 U	1.4 U
Dieldrin	0.02	8	0.88 U*	0.83 U*	0.77 U*	0.98 U*	1 U*	0.94 U*	0.97 U*	0.83 U*	0.99 U*	0.8 U*	--	1.2 U*	1.4 U*
Endosulfan sulfate	--	--	0.7 U	0.66 U	0.61 U	0.77 U	0.79 U	0.75 U	0.76 U	0.66 U	0.78 U	0.63 U	--	0.94 U	1.1 U
Endosulfan-alpha (I)	--	--	0.88 U	0.83 U	0.77 UJ	0.98 U	1 U	0.94 U	0.97 U	0.83 U	0.99 U	0.8 U	--	1.2 U	1.4 U
Endosulfan-beta (II)	--	--	0.8 U	0.75 U	0.7 U	0.89 U	0.91 U	0.85 U	0.88 U	0.75 U	0.9 U	0.73 U	--	1.1 U	1.2 U
Endrin	--	--	0.78 U	0.73 U	0.68 U	0.87 U	0.88 U	0.83 U	0.85 U	0.73 U	0.87 U	0.71 U	--	1.1 U	1.2 U
Endrin aldehyde	--	--	0.78 U	0.73 U	0.68 U	0.87 U	0.88 U	0.83 U	0.85 U	0.73 U	0.87 U	0.71 U	--	1.1 U	1.2 U
Endrin ketone	--	--	0.62 U	0.58 U	0.54 U	0.68 U	0.7 U	0.66 U	0.67 U	0.58 U	0.69 U	0.56 U	--	0.83 U	0.95 U
Heptachlor	--	--	0.88 U	0.83 U	0.77 U	0.98 U	1 U	0.94 U	0.97 U	0.83 U	0.99 U	0.8 U	--	1.2 U	1.4 U
Heptachlor epoxide	--	--	0.88 U	0.83 U	0.77 U	0.98 U	1 U	0.94 U	0.97 U	0.83 U	0.99 U	0.8 U	--	1.2 U	1.4 U
Hexachlorocyclohexane, alpha (BHC)	--	--	0.88 U	0.83 U	0.77 UJ	0.98 U	1 U	0.94 U	0.97 U	0.83 U	0.99 U	0.8 U	--	1.2 U	1.4 U
Hexachlorocyclohexane, beta- (BHC)	--	--	0.88 U	0.83 U	0.77 U	0.98 U	1 U	0.94 U	0.97 U	0.83 U	0.99 U	0.8 U	--	1.2 U	1.4 U
Hexachlorocyclohexane, delta (BHC)	--	--	0.88 U	0.83 U	0.77 U	0.98 U	1 U	0.94 U	0.97 U	0.83 U	0.99 U	0.8 U	--	1.2 U	1.4 U
Hexachlorocyclohexane, gamma- (BHC) (Lindane)	--	--	0.88 U	0.83 U	0.77 U	0.98 U	1 U	0.94 U	0.97 U	0.83 U	0.99 U	0.8 U	--	1.2 U	1.4 U
Methoxychlor	--	--	4.5 UJ	4.2 UJ	3.9 UJ	5 UJ	5.1 UJ	4.8 UJ	4.9 UJ	4.2 UJ	5.1 UJ	4.1 UJ	--	6.1 UJ	7 UJ
Toxaphene	--	--	23 U	21 U	20 U	25 U	26 U	24 U	25 U	21 U	25 U	21 U	--	30 U	35 U
Total DDx (U = 1/2)	--	--	1.1 UJ	1 UJ	0.97 UJ	1.2 UJ	1.3 UJ	1.2 UJ	1.2 UJ	1 UJ	1.2 UJ	1 UJ	--	1.5 UJ	1.7 UJ
Total DDx (U = 0)	1.58	46.1	1.1 UJ	1 UJ	0.97 UJ	1.2 UJ	1.3 UJ	1.2 UJ	1.2 UJ	1 UJ	1.2 UJ	1 UJ	--	1.5 UJ	1.7 UJ*
PCB Congeners (µg/kg)															
PCB-008	--	--	1 J	0.74 J	0.63 J	0.58 J	0.48 J	0.19 U	0.2 U	0.38 J	0.2 U	0.16 U	--	0.24 U	2.6 J
PCB-018	--	--	0.15 U	0.14 U	0.13 U	0.17 U	0.17 U	0.16 U	0.17 U	0.14 U	0.17 U	0.14 U	--	0.2 U	0.23 U
PCB-028	--	--	0.22 U	0.2 U	0.18 U	0.24 U	0.87 J	0.76 J	1.1 J	0.55 J	0.58 J	0.2 U	--	0.29 U	0.33 U
PCB-044	--	--	0.13 U	0.12 U	0.11 U	0.15 U	0.15 U	0.14 U	0.81 J	0.13 U	0.15 U	0.12 U	--	0.18 U	0.2 U
PCB-049	--	--	0.15 U	0.14 U	0.13 U	0.17 U	0.17 U	0.16 U	0.16 U	0.14 U	0.17 U	0.14 U	--	0.2 U	0.22 U
PCB-052	--	--	0.33 U	0.31 U	0.28 U	0.37 U	0.38 U	0.36 U	1.8 J	0.31 U	0.38 U	0.3 U	--	0.44 U	0.5 U
PCB-066	--	--	0.34 U	0.32 U	0.29 U	0.38 U	0.9 J	0.92 J	1.3 J	0.82 J	0.83 J	0.31 U	--	0.46 U	0.52 U
PCB-077	--	--	0.4 U	0.38 U	0.35 U	0.45 U	0.46 U	0.43 U	0.45 U	0.38 U	0.46 U	0.37 U	--	0.54 U	0.61 U
PCB-087	--	--	0.13 U	0.12 U	0.11 U	0.14 U	0.14 U	0.14 U	0.14 U	0.12 U	0.14 U	0.12 U	--	0.17 U	0.19 U
PCB-101	--	--	0.13 U	0.12 U	0.11 U	0.14 U	0.14 U	0.13 U	0.14 U	0.42 J	0.14 U	0.11 U	--	0.17 U	0.19 U
PCB-105	--	--	0.36 U	0.34 U	0.31 U	0.4 U	0.41 U	0.39 U	0.4 U	0.34 U	0.41 U	0.33 U	--	0.48 U	0.54 U
PCB-118	--	--	0.3 U	0.28 U	0.26 U	0.34 U	0.34 U	0.32 U	0.33 U	0.29 U	0.34 U	0.28 U	--	0.4 U	0.45 U
PCB-126	--	--	0.38 U	0.35 U	0.32 U	0.42 U	0.43 U	0.41 U	0.42 U	0.36 U	0.43 U	0.35 U	--	0.5 U	0.57 U
PCB-128	--	--	0.15 U	0.14 U	0.12 U	0.16 U	0.17 U	0.16 U	0.16 U	0.14 U	0.17 U	0.13 U	--	0.19 U	0.22 U
PCB-138	--	--	0.18 U	0.17 U	0.16 U	0.2 U	0.21 U	0.2 U	0.2 U	0.17 U	0.21 U	0.17 U	--	0.24 U	0.28 U
PCB-153	--	--	0.28 U	0.26 U	0.24 U	0.31 U	0.32 U	0.3 U	0.31 U	0.27 U	0.32 U	0.26 U	--	0.37 U	0.42 U
PCB-156	--	--	0.3 U	0.28 U	0.25 U	0.33 U	0.34 U	0.32 U	0.33 U	0.28 U	0.34 U	0.27 U	--	0.4 U	0.45 U
PCB-169	--	--	0.26 U	0.24 U	0.22 U	0.29 U	0.29 U	0.28 U	0.28 U	0.24 U	0.29 U	0.23 U	--	0.34 U	0.39 U
PCB-170	--	--	0.28 U	0.26 U	0.24 U	0.31 U	0.32 U	0.3 U	0.31 U	0.27 U	0.32 U	0.26 U	--	0.37 U	0.42 U
PCB-180	--	--	0.31 U	0.29 U	0.26 U	0.35 U	0.35 U	0.33 U	0.34 U	0.29 U	0.35 U	0.28 U	--	0.41 U	0.47 U
PCB-183	--	--	0.21 U	0.2 U	0.18 U	0.24 U	0.24 U	0.23 U	0.23 U	0.2 U	0.24 U	0.19 U	--	0.28 U	0.32 U
PCB-184	--	--	0.19 U	0.18 U	0.17 U	0.22 U	0.22 U	0.21 U	0.21 U	0.18 U	0.22 U	0.18 U	--	0.26 U	0.29 U
PCB-187	--	--	0.19 U	0.17 U	0.16 U	0.21 U	0.21 U	0.2 U	0.2 U	0.18 U	0.21 U	0.17 U	--	0.25 U	0.28 U
PCB-195	--	--	0.24 U	0.22 U	0.2 U	0.27 U	0.27 U	0.26 U	0.26 U	0.23 U	0.27 U	0.22 U	--	0.32 U	0.36 U
PCB-206	--	--	0.13 U	0.12 U	0.11 U	0.15 U	0.15 U	0.14 U	0.15 U	0.13 U	0.15 U	0.12 U	--	0.18 U	0.2 U
PCB-209	--	--	0.3 U	0.28 U	0.25 U	0.33 U	0.34 U	0.32 U	0.33 U	0.28 U	0.34 U	0.27 U	--	0.4 U	0.45 U
Total PCB Congener (U = 1/2)	--	--	4.02 J	3.555 J	3.2 J	3.95 J	5.36 J	4.72 J	7.87 J	4.705 J	4.62 J	0.37 U	--	0.54 U	7.15 J
Total PCB Congener (U = 0)	--	--	1 J	0.74 J	0.63 J	0.58 J	2.25 J	1.68 J	5.01 J	2.17 J	1.41 J	0.37 U	--	0.54 U	2.6 J
Total Petroleum Hydrocarbons (mg/kg)															
Diesel range organics (C10 - C28)	--	--	0.0035 U	0.0032 U	0.003 U	0.0039 U	0.0039 U	0.0037 U	0.0038 U	0.0033 U	0.0039 U	0.0073 J	--	0.011 J	0.0053 U
Oil range organics (C28-C40)	--	--	0.0035 UJ	0.0032 UJ	0.003 UJ	0.0039 UJ	0.0039 UJ	0.0037 UJ	0.0038 UJ	0.0033 UJ	0.0039 UJ	0.0032 UJ	--	0.0047 UJ	0.0053 UJ

Table 13
Final Validated Data - Sediment Chemistry Results

FINAL VALIDATED DATA		Location ID	GP-DU1-COMP	GP-DU2-COMP	GP-DU3-COMP	GP-DU4-COMP	GP-DU5-COMP	GP-DU6-COMP	GP-DU7-COMP	GP-DU8-COMP	GP-DU9-COMP	GP-DU10-COMP	GP-DU10-COMP	RS-GP-C	RS-PAS-A
		Sample ID	GP-DU1-COMP	GP-DU2-COMP	GP-DU3-COMP	GP-DU4-COMP	GP-DU5-COMP	GP-DU6-COMP	GP-DU7-COMP	GP-DU8-COMP	GP-DU9-COMP	GP-DU10-COMP	GP-DU10-COMP-A	RS-GP-C	RS-PAS-A
		Sample Date	12/1/2012	11/30/2012	11/30/2012	11/29/2012	11/28/2012	11/27/2012	11/28/2012	11/26/2012	11/25/2012	11/24/2012	11/24/2012	11/30/2012	11/30/2012
		Sample Type	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Reference	Reference
	ERL	ERM													

Notes:
Detected concentration is greater than ERL (effects range - low) screening level
Detected concentration is greater than ERM (effects range - median) screening level
* Results marked with an asterisk (*) are non-detect results that exceed the ERL screening level.

Bold = Detected result
-- = not reported or not applicable
HPAH = high molecular weight polycyclic aromatic hydrocarbon
J = Estimated value
LPAH = low molecular weight polycyclic aromatic hydrocarbon
mg/kg = milligrams per kilogram
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
pct = percent
su = standard unit
U = Compound analyzed, but not detected above detection limit
µg/kg = micrograms per kilogram

All non-detect results are reported at the **method detection limit**.
The method detection limit is the minimum concentration that can be measured and reported with 99 percent confidence that the concentration is greater than zero, but the exact concentration cannot be reliably quantified.
In the sediment chemistry results table, the MDL is used instead of the RL because several compounds have RLs greater than the screening level values (e.g., ERLs) and use of the MDL illustrates that the compound is likely also non-detect at concentrations below these screening level values.
The full analytical laboratory report in Appendix B contains the RL information.

Totals are calculated as the sum of all detected results (U=0). If all results are not detected, the highest reporting limit value is reported as the sum.
Totals are calculated as the sum of all detected results and half of the reporting limit of undetected results (U=1/2). If all results are not detected, the highest reporting limit value is reported as the sum.
Total LPAH are the total of 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene.
Total HPAH are the total of benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(x)fluoranthenes, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, and pyrene.
Total DDx consists of the sum of 4,4'-DDD, 4,4'-DDE, 4,4'-DDT 2,4'-DDD, 2,4'-DDE, and 2,4'-DDT if measured.
Total PCB congeners is the total of all PCB congeners listed in this table.

FINAL VALIDATED DATA

Table 14

Results of Solid Phase Test Using *Leptocheirus plumulosus*

Sample ID	Number Surviving					Mean Survival (%)	Meets LPC for Ocean Disposal
	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
Control (Group 1)	20	19	18	20	20	97	N/A
Control (Group 2)	20	20	20	16	18	94	N/A
RS-PAS-A	16	15	12	14	14	<i>71</i> ¹	N/A
RS-GP-C	16	18	18	16	16	84	N/A
GP-DU1	11	9	8	9	11	48	No
GP-DU2	12	14	12	14	14	66	Yes
GP-DU3	14	14	14	16	14	72	Yes
GP-DU4	12	12	11	12	14	61	No
GP-DU5	17	14	16	15	14	76	Yes
GP-DU6	14	16	13	14	12	69	Yes
GP-DU7	14	17	20	17	15	83	Yes
GP-DU8	9	10	7	11	10	47	No
GP-DU9	16	14	18	17	15	80	Yes
GP-DU10	12	11	14	14	12	63	No

Notes:

Bold = Value significantly less than the Gulfport reference ($P < 0.05$).

Italicized = Value significantly less than the control ($P < 0.05$).

¹ Did not meet minimum reference survival criteria.


 Sample does not meet LPC requirements for ocean disposal

Table 15**Results of Solid Phase Re-Test Using *Leptocheirus plumulosus***

Sample ID	Number Surviving					Mean Survival (%)	Meets LPC for Ocean Disposal
	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
Control	20	20	20	20	20	100	N/A
GP-DU1	20	20	20	20	19	99	Yes
GP-DU4	20	19	20	20	19	98	Yes
GP-DU8	20	20	19	20	20	99	Yes
GP-DU10B	20	20	20	20	20	100	Yes

Table 16**Results of Solid Phase Test Using *Neanthes arenaceodentata***

Sample ID	Number Surviving					Mean Survival (%)	Meets LPC for Ocean Disposal
	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5		
Control (Group 1)	10	10	10	10	10	100	N/A
Control (Group 2)	10	10	10	10	10	100	N/A
RS-PAS-A	10	10	10	10	10	100	N/A
RS-GP-C	10	8	10	10	10	96	N/A
GP-DU1	10	10	10	10	10	100	Yes
GP-DU2	10	10	8	10	9	94	Yes
GP-DU3	10	10	10	10	10	100	Yes
GP-DU4	10	10	10	10	9	98	Yes
GP-DU5	10	10	10	10	10	100	Yes
GP-DU6	10	10	10	10	10	100	Yes
GP-DU7	10	10	10	10	10	100	Yes
GP-DU8	10	10	10	10	10	100	Yes
GP-DU9	10	10	10	10	10	100	Yes
GP-DU10	10	10	10	10	10	100	Yes

Table 17

Results of Suspended Particulate Phase Test Using *Arbacia punctulata*

Sample ID	Treatment	Mean Normal Development (%)	EC ₅₀ (%)	Mean Survival (%)	LC ₅₀ (%)
GP-DU1	Control	77.6	> 100	82.8	> 100
	Site Water	74		80.2	
	1	74.2		79.6	
	10	74.6		80.4	
	50	70.2		75	
	100	71.4		77.4	
GP-DU2	Control	77.6	> 100	82.8	> 100
	Site Water	74		80.2	
	1	72		78.8	
	10	72.8		79.6	
	50	73.6		78.8	
	100	72.6		79	
GP-DU3	Control	77.6	> 100	82.8	> 100
	Site Water	74		80.2	
	1	76.2		82.8	
	10	76.4		82.4	
	50	71.6		77.6	
	100	71.2		78	
GP-DU4	Control	77.6	> 100	82.8	> 100
	Site Water	74		80.2	
	1	73.8		63.4	
	10	65.8		73.6	
	50	67.8		75	
	100	71		76.4	
GP-DU5	Control	77.6	> 100	82.8	> 100
	Site Water	74		80.2	
	1	71.6		78.4	
	10	75		82	
	50	69.2		76.4	
	100	69.4		76.2	
GP-DU6	Control	76	> 100	81.8	> 100
	Site Water	71.2		77.4	
	1	70.4		77.6	
	10	66.4		74.2	
	50	69.8		76.6	
	100	59.8		67.2	
GP-DU7	Control	76	> 100	81.8	> 100

Table 17

Results of Suspended Particulate Phase Test Using *Arbacia punctulata*

Sample ID	Treatment	Mean Normal Development (%)	EC ₅₀ (%)	Mean Survival (%)	LC ₅₀ (%)
	Site Water	71.2		77.4	
	1	66.2		73.6	
	10	74.8		81.2	
	50	61.8		70.8	
	100	65.8		74.6	
GP-DU8	Control	76	> 100	81.8	> 100
	Site Water	71.2		77.4	
	1	71		81.2	
	10	78		83.8	
	50	76		81.4	
	100	66.6		74.2	
GP-DU9	Control	76	> 100	81.8	> 100
	Site Water	71.2		77.4	
	1	77.2		83	
	10	71		82.2	
	50	67.8		77.4	
	100	69.2		75	
GP-DU10	Control	76	> 100	81.8	> 100
	Site Water	71.2		77.4	
	1	78.6		85.6	
	10	68.4		75.6	
	50	64.4		71.4	
	100	61		69.6	

Notes:

Bold = Normal development significantly less than the control (P < 0.05).

Table 18**Results of Suspended Particulate Phase Test Using *Americamysis bahia***

Sample ID	Treatment	Mean Survival (%)	LC ₅₀ (%)
GP-DU1	Control	100	> 100
	Site Water	96	
	10	100	
	50	96	
	100	100	
GP-DU2	Control	100	> 100
	Site Water	96	
	10	98	
	50	98	
	100	100	
GP-DU3	Control	100	> 100
	Site Water	96	
	10	98	
	50	98	
	100	100	
GP-DU4	Control	100	> 100
	Site Water	96	
	10	100	
	50	100	
	100	100	
GP-DU5	Control	100	> 100
	Site Water	96	
	10	96	
	50	96	
	100	100	
GP-DU6	Control	100	> 100
	Site Water	96	
	10	94	
	50	96	
	100	100	
GP-DU7	Control	100	> 100
	Site Water	96	
	10	100	
	50	98	
	100	100	
GP-DU8	Control	100	> 100
	Site Water	96	
	10	94	

Table 18**Results of Suspended Particulate Phase Test Using *Americamysis bahia***

Sample ID	Treatment	Mean Survival (%)	LC ₅₀ (%)
	50	98	
	100	100	
GP-DU9	Control	100	> 100
	Site Water	96	
	10	98	
	50	98	
	100	96	
GP-DU10	Control	100	> 100
	Site Water	96	
	10	96	
	50	96	
	100	96	

Table 19**Results of Suspended Particulate Phase Test Using *Menidia beryllina***

Sample ID	Treatment	Mean Survival (%)	LC ₅₀ (%)
GP-DU1	Control	94	> 100
	Site Water	94	
	10	92	
	50	86	
	100	90	
GP-DU2	Control	94	> 100
	Site Water	94	
	10	90	
	50	90	
	100	86	
GP-DU3	Control	94	> 100
	Site Water	94	
	10	88	
	50	88	
	100	82	
GP-DU4	Control	94	> 100
	Site Water	94	
	10	90	
	50	74	
	100	78	
GP-DU5	Control	94	> 100
	Site Water	94	
	10	90	
	50	88	
	100	84	
GP-DU6	Control	96	> 100
	Site Water	94	
	10	96	
	50	92	
	100	86	
GP-DU7	Control	96	> 100
	Site Water	94	
	10	90	
	50	96	
	100	100	
GP-DU8	Control	96	> 100
	Site Water	94	
	10	92	

Table 19

Results of Suspended Particulate Phase Test Using *Menidia beryllina*

Sample ID	Treatment	Mean Survival (%)	LC ₅₀ (%)
	50	88	
	100	82	
GP-DU9	Control	96	> 100
	Site Water	94	
	10	92	
	50	92	
	100	70	
GP-DU10	Control	96	> 100
	Site Water	94	
	10	94	
	50	94	
	100	88	

Notes:

Bold = Survival significantly less than the control (P < 0.05).

Table 20

Results of Bioaccumulation Potential Test Using *Macoma nasuta*

Sample ID	Number Surviving					Mean Survival (%)
	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	
Control	7	8	8	7	7	92.5
RS-PAS-A	8	8	8	8	8	100
RS-GP-C	8	8	7	8	8	97.5
GP-DU1	7	5	4	4	4	60 ¹
GP-DU2	7	7	6	7	6	82.5
GP-DU3	7	8	7	8	8	95
GP-DU4	5	5	6	6	6	70 ¹
GP-DU5	7	7	7	5	6	80
GP-DU6	7	7	8	6	5	82.5
GP-DU7	6	8	8	8	8	95
GP-DU8	8	8	7	6	8	92.5
GP-DU9	7	8	8	8	7	95
GP-DU10	7	8	5	7	7	85

Notes:

1 Mean survival did not meet minimum test treatment survival criteria of 75 percent (USEPA Region IV/USACE SAD 2008).

Table 21**Results of Bioaccumulation Potential Test Using *Nereis virens***

Sample ID	Number Surviving					Mean Survival (%)
	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	
Control	5	5	5	5	4	96
RS-PAS-A	5	4	5	4	5	92
RS-GP-C	4	3	3	3	3	64 ¹
GP-DU1	5	5	5	5	4	96
GP-DU2	5	5	5	5	5	100
GP-DU3	5	5	5	4	4	92
GP-DU4	4	4	4	4	4	80
GP-DU5	5	4	3	4	4	80
GP-DU6	4	4	4	3	4	76
GP-DU7	4	3	4	3	4	72 ²
GP-DU8	5	5	4	5	5	96
GP-DU9	5	5	4	4	3	84
GP-DU10	0	0	0	4	3	28 ²

Notes:

1 Mean survival did not meet minimum reference survival criteria of 90 percent (USEPA Region IV/USACE SAD 2008).

2 Mean survival did not meet minimum test treatment survival criteria of 75 percent (USEPA Region IV/USACE SAD 2008).

Table 22
ODMDS Input Parameters

Parameter	Units	ODMDS Site			
		Gulfport Western	Pascagoula Zone A	Pascagoula Zone B	Pascagoula Zone C
		Value			
Site Description					
Number of Grid Points (left to right + x direction)		45			
Number of Grid Points (top to bottom + z direction)		45			
Grid Spacing (left to right)	ft	300	500	600	400
Grid Spacing (top to bottom)	ft	600	500	600	600
Constant Water Depth	ft	25	44	46	47
Roughness Height at Bottom of Disposal Site	ft	0.005 ¹			
Bottom Slope (x-direction)	deg.	0			
Bottom Slope (z-direction)	deg.	0			
Number of Points in Density Profile		2			
Density at Point One (depth = 5 ft)	g/cc	1.0175	1.0174	1.0174	1.0174
Density at Point Two (depth = 44 ft for Pascagoula; depth = 47 ft for GP West)	g/cc	1.0205	1.0230	1.0230	1.0230
Velocity					
Type of Velocity Profile		2-Point at constant depth			
X-Direction Velocity (depth = 10 ft)	ft/sec	0.303	-0.232	-0.232	-0.232
Z-Direction Velocity (depth = 10 ft)	ft/sec	0.582	-0.232	-0.232	-0.232
X-Direction Velocity (depth = 40 ft for Pascagoula; depth = 47 ft for GP West)	ft/sec	0.227	-0.116	-0.116	-0.116
Z-Direction Velocity (depth = 40 ft for Pascagoula; depth = 47 ft for GP West)	ft/sec	0.436	+0.116	+0.116	+0.116
Disposal Operation					
Disposal Point Top of Grid	ft	13,800 ²	8,500 ³	13,500 ³	9,660 ³
Disposal Point Left Edge of Grid	ft	1,200 ² /1,800 ²	8,200 ³	14,500 ³	11,200 ³
Dumping Over Depression		0	0	0	0
Solid Fraction Volume Concentration		Gravel = 0.0, Sand = 0.080, Silt = 0.123, Clay = 0.259			
Volume of Each Layer	cy	8,000 ⁴	1,3000 ⁴		
Length of Disposal Vessel Bin	ft	21			
Width of Disposal Vessel Bin	ft	14			
Pre-disposal Draft	ft	28			
Post-disposal Draft	ft	10			
Duration	sec	14,400			
Long Term Time Step for Diffusion	sec	600			
Time to Empty Vessel	sec	30			
Location of Upper Left Corner of Disposal Site (distance from top edge)	ft	600	2,000	2,000	2,000
Location of Upper Left Corner of Disposal Site (distance from left edge)	ft	900	2,000	2,000	2,000
Location of Lower Right Corner of Disposal Site (distance from top edge)	ft	27,000	21,500	25,000	25,000
Location of Lower Right Corner of Disposal Site (distance from left edge)	ft	4,500	20,500	27,000	15,800
Coefficients					
Settling Coefficient		0.000 ¹			

Table 22
ODMDS Input Parameters

Parameter	Units	ODMDS Site			
		Gulfport Western	Pascagoula Zone A	Pascagoula Zone B	Pascagoula Zone C
		Value			
Apparent Mass Coefficient		1.000 ¹			
Drag Coefficient		0.500 ¹			
Form Drag for Collapsing Cloud		1.000 ¹			
Skin Friction for Collapsing Cloud		0.010 ¹			
Drag for an Ellipsoidal Wedge		0.100 ¹			
Drag for a Plate		1.000 ¹			
Friction Between Cloud and Bottom		0.010 ¹			
4/3 Law Horizontal Diffusion Dissipation Factor		0.001 ¹			
Unstratified Water Vertical Diffusion Coefficient		Pritchard Expression			
Cloud/Ambient Density Gradient Ratio		0.250 ¹			
Turbulent Thermal Entrainment		0.235 ¹			
Entrainment in Collapse		0.100 ¹			
Stripping Factor		0.003 ¹			

Notes:

1 Model default value.

2 Disposal point is not the center of disposal site. The center point is 13,800 feet from the top edge of the grid and 2,700 feet from the left edge. To pass LPC criteria, the disposal point from left edge of grid was adjusted and was different for hopper/manual dredge models, respectively.

3 Represents center of the zone.

4 Model was run with multiple volumes between 4,000 and 13,000 cy using both manual and hopper dredges. Highest disposal volume that met LPC criteria with either manual or hopper dredge was 8,000 cy in Gulfport Western and 13,000 cy in Pascagoula Zone A, B, and C.

deg. = degree

ft = feet

ft/sec = feet per second

g/cc = grams per cubic centimeter

ODMDS = Ocean Dredged Material Disposal Sites

USACE = U.S. Army Corps of Engineers

USEPA = U.S. Environmental Protection Agency

Table 23
Toxicity Initial Mixing Computational Results: 4-Hour Criteria

Site	Dredge Volume ¹ (cy)	Time (hrs)	Depth (ft)	Manual Dredge		Hopper Dredge		STFATE Summary Result
				Maximum Concentration Above Background (Ctox) on Grid (%)	Dilution on Grid (%)	Maximum Concentration Above Background (Ctox) on Grid (%)	Dilution on Grid (%)	
Gulfport Western	8000	4.00	5.0	2.52E-02	3.97E+03	2.39E-02	4.18E+03	Toxicity criteria for the disposal site were not violated; LPC met
		4.00	10.0	1.42E-01	7.03E+02	1.42E-01	7.03E+02	
		4.00	15.0	2.70E-01	3.69E+02	2.78E-01	3.59E+02	
		4.00	15.4/15.5 ²	2.71E-01	3.68E+02	2.80E-01	3.56E+02	
		4.00	20.0	1.72E-01	5.80E+02	1.79E-01	5.58E+02	
		4.00	25.0	3.67E-02	2.72E+03	3.79E-02	2.64E+03	
Pascagoula Zone A	13000	4.00	10.0	7.23E-06	1.38E+07	6.59E-06	1.52E+07	Toxicity criteria for the disposal site were not violated; LPC met
		4.00	20.0	9.50E-03	1.05E+04	9.19E-03	1.09E+04	
		4.00	30.0	2.72E-01	3.67E+02	2.73E-01	3.65E+02	
		4.00	33.8	3.58E-01	2.78E+02	3.61E-01	2.76E+02	
Pascagoula Zone B		4.00	40.0	1.70E-01	5.87E+02	1.72E-01	5.80E+02	Toxicity criteria for the disposal site were not violated; LPC met
		4.00	10.0	1.16E-06	8.62E+07	1.06E-06	9.43E+07	
		4.00	20.0	3.21E-03	3.12E+04	3.10E-03	3.23E+04	
		4.00	30.0	1.96E-01	5.09E+02	1.95E-01	5.12E+02	
Pascagoula Zone C		4.00	35.8	3.69E-01	2.70E+02	3.70E-01	2.69E+02	Toxicity criteria for the disposal site were not violated; LPC met
		4.00	40.0	2.62E-01	3.81E+02	2.64E-01	3.78E+02	
		4.00	10.0	4.20E-07	2.38E+08	3.77E-07	2.65E+08	
		4.00	20.0	1.69E-03	5.92E+04	1.61E-03	6.21E+04	
		4.00	30.0	1.49E-01	6.70E+02	1.49E-01	6.70E+02	
		4.00	36.8	3.57E-01	2.79E+02	3.61E-01	2.76E+02	
		4.00	40.0	2.92E-01	3.41E+02	2.96E-01	3.37E+02	

Notes:

Bolded values indicate highest concentration at an ODMDS

1 Volumes between 4,000 and 13,000 cy modeled; the highest volume that met LPC criteria is shown in the table.

2 The first depth represents the depth modeled for the manual dredge; the second depth represents the depth modeled for the hopper dredge.

Ctox = Continuous Trap Oxidizer

ft = feet

hrs = hours

LPC = limiting permissible concentration

Table 24
Toxicity Initial Mixing Computational Results: Disposal Site Boundary Criteria

Site	Dredge Volume ¹ (cy)	Time (hrs)	Depth (ft)	Manual Dredge		Hopper Dredge		STFATE Summary Result
				Maximum Concentration Above Background (Ctox) on Grid (%)	Dilution on Grid (%)	Maximum Concentration Above Background (Ctox) on Grid (%)	Dilution on Grid (%)	
Gulfport Western	8000	5.0	4.00	2.52E-02	3.97E+03	2.39E-02	4.18E+03	Toxicity criteria for the disposal site were not violated; LPC met
		10.0	4.00	1.42E-01	7.03E+02	1.42E-01	7.03E+02	
		15.0	2.50	6.60E-01	1.51E+02	6.41E-01	1.55E+02	
		15.4/15.5 ²	2.17	9.50E-01	1.04E+02	9.47E-01	1.05E+02	
		20.0	2.17	8.48E-01	1.17E+02	8.32E-01	1.19E+02	
		25.0	2.17	1.29E-01	7.74E+02	1.28E-01	7.80E+02	
Pascagoula Zone A	13000	10.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	Toxicity criteria for the disposal site were not violated; LPC met
		20.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	
		30.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	
		33.8	ALL TIMES	0.00E+00	NA	0.00E+00	NA	
		40.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	
Pascagoula Zone B		10.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	Toxicity criteria for the disposal site were not violated; LPC met
		20.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	
		30.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	
		36.8	ALL TIMES	0.00E+00	NA	0.00E+00	NA	
		40.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	
Pascagoula Zone C		10.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	Toxicity criteria for the disposal site were not violated; LPC met
		20.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	
		30.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	
		36.8	ALL TIMES	0.00E+00	NA	0.00E+00	NA	
		40.0	ALL TIMES	0.00E+00	NA	0.00E+00	NA	

Notes:

Bolded values indicate highest concentration at an ODMDS

1 Volumes between 4,000 and 13,000 cy modeled; for Gulfport Western, the highest dredge volume using either a manual or hopper dredge that met LPC criteria was 8,000 cy. For Pascagoula, 13,000 cy met the LPC criteria.

2 The first depth represents the depth modeled for the manual dredge; the second depth represents the depth modeled for the hopper dredge.

Ctox = Continuous Trap Oxidizer

ft = feet

hrs = hours

LPC = limiting permissible concentration

NA = not applicable

Table 25
Results of Tissue *Macoma nasuta*

FINAL VALIDATED DATA		Sample Name Sample Date Sample Type	Background Tissue M. Nasuta TRP A 1/7/2013 N	Background Tissue M. Nasuta TRP B 1/7/2013 N	Background Tissue M. Nasuta TRP C 1/7/2013 N	Background Tissue M. Nasuta AVERAGE AVG	RS-GP-C M. Nasuta Clam Rep A 2/6/2013 N	RS-GP-C M. Nasuta Clam Rep B 2/6/2013 N	RS-GP-C M. Nasuta Clam Rep C 2/6/2013 N	RS-GP-C M. Nasuta Clam Rep D 2/6/2013 N	RS-GP-C M. Nasuta Clam Rep E 2/6/2013 N	RS-GP-C M. Nasuta Clam AVERAGE AVG	RS-PAS-A M. Nasuta Clam Rep A 2/5/2013 N	RS-PAS-A M. Nasuta Clam Rep B 2/5/2013 N	RS-PAS-A M. Nasuta Clam Rep C 2/5/2013 N	RS-PAS-A M. Nasuta Clam Rep D 2/5/2013 N	RS-PAS-A M. Nasuta Clam Rep E 2/5/2013 N
	Steady-state factor*	FDA Limits*															
Conventional Parameters (pct)																	
Lipids	--	--	1.7	1.6	1.7	1.67	1.1	0.73	0.7	0.8	0.63	0.792	0.62	0.91	0.42	0.55	0.7
Metals (mg/kg)																	
Arsenic	1.0	86	4	3.8	2.7	3.5	4.5	4	5	4.9	3.8	4.44	4	4.1	4.9	4.5	5
Cadmium	1.0	3	0.43 U	0.4 U	0.39 U	0.41 U	0.43 U	0.46 U	0.45 U	0.34 U	0.34 U	0.404 U	0.4 U	0.35 U	0.49 U	0.49 U	0.46 U
Chromium	1.0	13	0.43 U	0.28 J	0.2 J	0.23 J	0.24 J	0.21 J	0.23 J	0.25 J	0.28 J	0.242 J	0.37 J	0.28 J	0.29 J	0.35 J	0.34 J
Copper	1.0	--	2.7	2.6	1.1	2.13	2	2.2	2.1	2.4	2.5	2.24	2.5	1.8	1.9	3.9	2.4
Lead	1.0	1.7	0.22 U	0.25	0.13 J	0.16 J	0.28	0.25	0.27	0.39	0.23	0.284	0.37	0.26	0.23 J	0.48	0.33
Mercury	1.0	1	0.014 UJ	0.012 U	0.016 U	0.014 UJ	0.0088 J	0.011 U	0.013 U	0.013 U	0.015 U	0.00696 J	0.015 U	0.013 U	0.017 U	0.015 U	0.015 U
Nickel	1.0	80	0.57	0.56	0.22 J	0.45 J	0.92	0.45 J	0.54	0.5	0.8	0.642 J	0.66	0.45	0.5	0.84	0.62
Selenium	1.0	--	0.26 J	0.38 J	0.32 J	0.32 J	0.49	0.42 J	0.4 J	0.32 J	0.44	0.414 J	0.33 J	0.41	0.46 J	0.57	0.49
Silver	1.0	--	0.086 U	0.031 J	0.02 J	0.031 J	0.0099 J	0.018 J	0.025 J	0.046 J	0.015 J	0.02278 J	0.031 J	0.012 J	0.022 J	0.072 J	0.012 J
Zinc	1.0	--	21	19	130	56.67	24	21	23	20	23	22.2	19	19	16	21	48
Polycyclic Aromatic Hydrocarbons (µg/kg)																	
1-Methylnaphthalene	1.0	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
2-Methylnaphthalene	1.0	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Acenaphthene	1.0	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Acenaphthylene	1.0	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Anthracene	1.0	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Benzo(a)anthracene	1.7	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Benzo(a)pyrene	2.1	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Benzo(b)fluoranthene	2.3	--	17 UJ	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Benzo(g,h,i)perylene	2.9	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Benzo(k)fluoranthene	2.3	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Chrysene	1.4	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Dibenzo(a,h)anthracene	2	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Fluoranthene	1.1	--	17 UJ	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Fluorene	1.0	--	17 UJ	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	3	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Naphthalene	1.0	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	21	17 UJ	11	--	--	--	--	--
Phenanthrene	1.0	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Pyrene	1.1	--	17 U	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Total HPAHs (U=1/2)	--	--	17 UJ	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	17 U	17 UJ	17 UJ	--	--	--	--	--
Total LPAHs (U=1/2)	--	--	17 UJ	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	72	17 UJ	21.2	--	--	--	--	--
Total PAHs (U=1/2)	--	--	17 UJ	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	165.5	17 UJ	39.9	--	--	--	--	--
Total PAHs (U = 0)	--	--	17 UJ	17 UJ	17 U	17 UJ	17 U	17 U	17 UJ	21	17 UJ	11	--	--	--	--	--
PCB Congeners (µg/kg)																	
PCB-008	--	--	1 U	0.98 U	4.9 U	2.29 U	--	--	--	--	--	--	1 U	1 U	0.98 U	0.98 U	1 U
PCB-018	--	--	1 U	0.98 U	4.9 U	2.29 U	--	--	--	--	--	--	1 U	1 U	0.98 U	0.98 U	1 U
PCB-028	--	--	1 U	0.98 U	4.9 U	2.29 U	--	--	--	--	--	--	1 U	0.3 J	0.98 U	0.98 U	1 U
PCB-044	--	--	1 U	0.98 U	4.9 U	2.29 U	--	--	--	--	--	--	1 U	1 U	0.98 U	0.98 U	1 U
PCB-049	--	--	1 U	0.98 U	4.9 U	2.29 U	--	--	--	--	--	--	1 U	1 U	0.98 U	0.98 U	1 U
PCB-052	--	--	1 U	0.98 U	4.9 U	2.29 U	--	--	--	--	--	--	1 U	1 U	0.98 U	0.45 J	1 U
PCB-066	--	--	1 U	0.98 U	4.9 U	2.29 U	--	--	--	--	--	--	0.51 J	1 U	0.98 U	0.98 U	1 U
PCB-077	--	--	1 U	0.2 J	27 J	9.23 J	--	--	--	--	--	--	1 U	3 J	0.98 U	5.5 J	1.3 J
PCB-087	--	--	1 U	0.98 U	4.1 J	1.70 J	--	--	--	--	--	--	0.51 J	1.6	0.98 U	2.8	2.1
PCB-101	--	--	1 U	0.98 U	12 J	4.33 J	--	--	--	--	--	--	0.47 J	2	0.98 U	4.2	2.7
PCB-105	--	--	1 U	0.98 U	1.3 J	0.76 J	--	--	--	--	--	--	0.28 J	1.4	0.98 U	2.9	2.2
PCB-118	--	--	1 U	0.98 U	5.9 J	2.30 J	--	--	--	--	--	--	1.1	2.4	0.98 U	4.9	3.6
PCB-126	--	--	1 U	0.98 U	4.9 U	2.29 U	--	--	--	--	--	--	1 U	1 U	0.98 U	0.98 U	1 U
PCB-128	--	--	1 U	0.98 U	26 J	9.00 J	--	--	--	--	--	--	0.31 J	1.3 J	0.98 U	2 J	1.4 J
PCB-138	--	--	1 U	0.98 U	22 J	7.66 J	--	--	--	--	--	--	1.4 J	4.8	0.98 U	7.2	5

Table 25
Results of Tissue *Macoma nasuta*

FINAL VALIDATED DATA		Sample Name Sample Date Sample Type	Background Tissue M. Nasuta TRP A 1/7/2013 N	Background Tissue M. Nasuta TRP B 1/7/2013 N	Background Tissue M. Nasuta TRP C 1/7/2013 N	Background Tissue M. Nasuta AVERAGE AVG	RS-GP-C M. Nasuta Clam Rep A 2/6/2013 N	RS-GP-C M. Nasuta Clam Rep B 2/6/2013 N	RS-GP-C M. Nasuta Clam Rep C 2/6/2013 N	RS-GP-C M. Nasuta Clam Rep D 2/6/2013 N	RS-GP-C M. Nasuta Clam Rep E 2/6/2013 N	RS-GP-C M. Nasuta Clam AVERAGE AVG	RS-PAS-A M. Nasuta Clam Rep A 2/5/2013 N	RS-PAS-A M. Nasuta Clam Rep B 2/5/2013 N	RS-PAS-A M. Nasuta Clam Rep C 2/5/2013 N	RS-PAS-A M. Nasuta Clam Rep D 2/5/2013 N	RS-PAS-A M. Nasuta Clam Rep E 2/5/2013 N
	Steady-state factor*	FDA Limits*															
PCB-153	--	--	1 U	0.98 U	26 J	9.00 J	--	--	--	--	--	--	1.1	3.2	0.98 U	4.9	3.8
PCB-156	--	--	1 U	0.98 U	4.9 U	2.29 U	--	--	--	--	--	--	1 U	0.46 J	0.98 U	0.75 J	0.47 J
PCB-169	--	--	1 U	0.98 U	4.9 U	2.29 U	--	--	--	--	--	--	1 U	1 U	0.98 U	0.98 U	1 U
PCB-170	--	--	0.67 J	0.24 J	98 J	33.0 J	--	--	--	--	--	--	0.66 J	1.8 J	0.26 J	3.1 J	2.1
PCB-180	--	--	0.35 J	0.37 J	80 J	26.9 J	--	--	--	--	--	--	0.42 J	2.5	0.98 U	3.5	1.9
PCB-183	--	--	1 U	0.98 U	18 J	6.33 J	--	--	--	--	--	--	0.68 J	0.37 J	0.98 U	1.3	0.32 J
PCB-184	--	--	1 U	0.98 U	4.9 U	2.29 U	--	--	--	--	--	--	1 U	1 U	0.98 U	0.98 U	1 U
PCB-187	--	--	1 U	0.98 U	61 J	20.7 J	--	--	--	--	--	--	1 U	0.9 J	0.98 U	1.6	0.79 J
PCB-195	--	--	1 U	0.98 U	16 J	5.66 J	--	--	--	--	--	--	1 U	1 U	0.98 U	0.98 U	1 U
PCB-206	--	--	0.87 J	0.98 U	110 J	37.1 J	--	--	--	--	--	--	1 U	0.28 J	0.98 U	3.7	0.27 J
PCB-209	--	--	1 U	0.98 U	10 J	3.66 J	--	--	--	--	--	--	1 U	1 U	0.98 U	0.47 J	1 U
Total PCB Congeners (NOAA) (U=1/2)	--	--	19.08 J	17.64 J	968.1 J	334.9 J	--	--	--	--	--	--	22.54 J	49.6 J	17.64 J	83.84 J	55.98 J
Total PCB Congeners (EPA Region 4) (U=1/2)	1.7	2000	13.54 J	12.74 J	545.4 J	190.6 J	--	--	--	--	--	--	15.46 J	32.4 J	12.74 J	54.23 J	34.39 J
Total PCB Congener (EPA Region 4) (U = 0)	--	--	1.89 J	0.81 J	517.3 J	173 J	--	--	--	--	--	--	7.44 J	26.31 J	0.26 J	49.27 J	27.95 J

Table 25
Results of Tissue *Macoma nasuta*

RS-PAS-A M. Nasuta Clam AVERAGE AVG	GP-DU1 M. Nasuta Clam Rep A 2/5/2013 N	GP-DU1 M. Nasuta Clam Rep B 2/5/2013 N	GP-DU1 M. Nasuta Clam Rep C 2/5/2013 N	GP-DU1 M. Nasuta Clam Rep D 2/5/2013 N	GP-DU1 M. Nasuta Clam Rep E 2/5/2013 N	GP-DU1 M. Nasuta Clam AVERAGE AVG	GP-DU2 M. Nasuta Clam Rep A 2/6/2013 N	GP-DU2 M. Nasuta Clam Rep B 2/6/2013 N	GP-DU2 M. Nasuta Clam Rep C 2/6/2013 N	GP-DU2 M. Nasuta Clam Rep D 2/6/2013 N	GP-DU2 M. Nasuta Clam Rep E 2/6/2013 N	GP-DU2 M. Nasuta Clam AVERAGE AVG	GP-DU3 M. Nasuta Clam Rep A 2/6/2013 N	GP-DU3 M. Nasuta Clam Rep B 2/6/2013 N	GP-DU3 M. Nasuta Clam Rep C 2/6/2013 N	GP-DU3 M. Nasuta Clam Rep D 2/6/2013 N	GP-DU3 M. Nasuta Clam Rep E 2/6/2013 N	GP-DU3 M. Nasuta Clam AVERAGE AVG	GP-DU4 M. Nasuta Clam Rep A 2/5/2013 N	GP-DU4 M. Nasuta Clam Rep B 2/5/2013 N
0.64	0.8	0.9	4.3	1.2	1.4	1.72	0.7	0.6	0.72	1.1	0.77	0.778	0.72	1	0.57	0.57	0.7	0.712	2.3	1.3
4.5	4.2	5.3	5	4.4	4.5	4.68	4.1	4	3	4.5	3.9	3.9	5	4.2	4.3	3.4	3.4	4.06	3.6	3.8
0.438 U	0.35 U	0.46 U	0.4 U	0.42 U	0.38 U	0.402 U	0.47 U	0.37 U	0.37 U	0.44 U	0.44 U	0.418 U	0.39 U	0.47 U	0.36 U	0.42 U	0.34 U	0.396 U	0.37 U	0.49 U
0.326 J	0.15 J	0.46 U	0.15 J	0.42 U	0.38 U	0.186 J	0.21 J	0.37	0.17 J	0.2 J	0.24 J	0.238 J	0.23 J	0.31 J	0.19 J	0.16 J	0.25 J	0.228 J	0.37 U	0.19 J
2.5	2.8	2.1	2.1	2.2	2.4	2.32	1.6	2.3	1.6	2.4	1.6	1.9	2.1	1.6	2.1	1.9	1.9	1.92	1.7	2.5
0.334 J	0.077 J	0.13 J	0.11 J	0.16 J	0.17 J	0.1294 J	0.12 J	0.24	0.099 J	0.19 J	0.098 J	0.1494 J	0.24	0.18 J	0.16 J	0.14 J	0.34	0.212 J	0.12 J	0.12 J
0.015 U	0.0089 J	0.014 U	0.0095 J	0.015	0.015	0.01108 J	0.012 UJ	0.013 UJ	0.013 UJ	0.015 UJ	0.016 UJ	0.0138 UJ	0.014 UJ	0.012 UJ	0.017 UJ	0.012 UJ	0.016 UJ	0.0142 UJ	0.014 UJ	0.017 UJ
0.614	0.29 J	0.34 J	0.31 J	0.35 J	0.36 J	0.33 J	0.37 J	0.42	0.22 J	0.47	0.29 J	0.354 J	0.48	0.36 J	0.38	0.3 J	0.48	0.4 J	0.42	0.46 J
0.452 J	0.33 J	0.43 J	0.39 J	0.35 J	0.33 J	0.366 J	0.47 U	0.37 U	0.37 U	0.44 U	0.44 U	0.418 U	0.39 U	0.47 U	0.36 U	0.42 U	0.34 U	0.396 U	0.37	0.4 J
0.0298 J	0.042 J	0.031 J	0.022 J	0.027 J	0.027 J	0.0298 J	0.02 J	0.062 J	0.021 J	0.016 J	0.038 J	0.0314 J	0.041 J	0.026 J	0.028 J	0.029 J	0.024 J	0.0296 J	0.018 J	0.18
24.6	19 J	23 J	18 J	28 J	19 J	21.4 J	22 J	39 J	16 J	20 J	22 J	23.8 J	29 J	31 J	21 J	21 J	18 J	24 J	17 J	49 J
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0.992 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.992 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.456 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.992 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.992 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.488 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.498 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2.158 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.5 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.972 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.454 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2.498	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.992 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.1 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3.778 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 25
Results of Tissue *Macoma nasuta*

RS-PAS-A M. Nasuta Clam AVERAGE AVG	GP-DU1 M. Nasuta Clam Rep A 2/5/2013 N	GP-DU1 M. Nasuta Clam Rep B 2/5/2013 N	GP-DU1 M. Nasuta Clam Rep C 2/5/2013 N	GP-DU1 M. Nasuta Clam Rep D 2/5/2013 N	GP-DU1 M. Nasuta Clam Rep E 2/5/2013 N	GP-DU1 M. Nasuta Clam AVERAGE AVG	GP-DU2 M. Nasuta Clam Rep A 2/6/2013 N	GP-DU2 M. Nasuta Clam Rep B 2/6/2013 N	GP-DU2 M. Nasuta Clam Rep C 2/6/2013 N	GP-DU2 M. Nasuta Clam Rep D 2/6/2013 N	GP-DU2 M. Nasuta Clam Rep E 2/6/2013 N	GP-DU2 M. Nasuta Clam AVERAGE AVG	GP-DU3 M. Nasuta Clam Rep A 2/6/2013 N	GP-DU3 M. Nasuta Clam Rep B 2/6/2013 N	GP-DU3 M. Nasuta Clam Rep C 2/6/2013 N	GP-DU3 M. Nasuta Clam Rep D 2/6/2013 N	GP-DU3 M. Nasuta Clam Rep E 2/6/2013 N	GP-DU3 M. Nasuta Clam AVERAGE AVG	GP-DU4 M. Nasuta Clam Rep A 2/5/2013 N	GP-DU4 M. Nasuta Clam Rep B 2/5/2013 N
2.698	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.534 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.992 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.584 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.762 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.632 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.992 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.856 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.992 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.048 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.492 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
45.92 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
29.84 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
22.25 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 25
Results of Tissue *Macoma nasuta*

GP-DU4 M. Nasuta Clam Rep C 2/5/2013 N	GP-DU4 M. Nasuta Clam Rep D 2/5/2013 N	GP-DU4 M. Nasuta Clam Rep E 2/5/2013 N	GP-DU4 M. Nasuta Clam AVERAGE AVG	GP-DU5 M. Nasuta Clam Rep A 2/6/2013 N	GP-DU5 M. Nasuta Clam Rep B 2/6/2013 N	GP-DU5 M. Nasuta Clam Rep C 2/6/2013 N	GP-DU5 M. Nasuta Clam Rep D 2/6/2013 N	GP-DU5 M. Nasuta Clam Rep E 2/6/2013 N	GP-DU5 M. Nasuta Clam AVERAGE AVG	GP-DU6 M. Nasuta Clam Rep A 2/6/2013 N	GP-DU6 M. Nasuta Clam Rep B 2/6/2013 N	GP-DU6 M. Nasuta Clam Rep C 2/6/2013 N	GP-DU6 M. Nasuta Clam Rep D 2/6/2013 N	GP-DU6 M. Nasuta Clam Rep E 2/6/2013 N	GP-DU6 M. Nasuta Clam AVERAGE AVG	GP-DU7 M. Nasuta Clam Rep A 2/5/2013 N	GP-DU7 M. Nasuta Clam Rep B 2/5/2013 N	GP-DU7 M. Nasuta Clam Rep C 2/5/2013 N	GP-DU7 M. Nasuta Clam Rep D 2/5/2013 N	GP-DU7 M. Nasuta Clam Rep E 2/5/2013 N
1	0.8	1.3	1.34	0.89	0.89	0.87	0.62	0.43	0.74	1.2	1.3	1.9	1.3	1.3	1.4	2.2	0.62	1.2	1	1.4
4	4.4	4.5	4.06	3.5	3.1	4.3	4.9	3.9	3.94	2.6	2.5	2.3	2.2	2.8	2.48	4.4	4.5	4.1	6.4	4.6
0.46 U	0.36 U	0.52 U	0.44 U	0.45 U	0.45 U	0.48 U	0.42 U	0.45 U	0.45 U	0.49 U	0.45 U	0.44 U	0.44 U	0.5 U	0.464 U	0.36 U	0.42 U	0.34 U	0.4 U	0.45 U
0.46 U	0.36 U	0.22 J	0.201 J	0.44 J	0.45 U	0.48 U	0.42 U	0.32 J	0.287 J	0.49 U	0.45 U	0.2 J	0.17 J	0.2 J	0.208 J	0.17 J	0.19 J	0.24 J	0.17 J	0.45 U
1.7	1.8	1.7	1.88	2.7	1.7	2.7	2.2	2.3	2.32	1.5	1.5	1.4	1.8	1.1	1.46	3	2.5	2.7	2.2	0.89 U
0.1 J	0.22	0.15 J	0.142 J	0.19 J	0.16 J	0.27	0.2 J	0.15 J	0.194 J	0.11 J	0.092 J	0.22 U	0.091 J	0.082 J	0.097 J	0.34	0.18 J	0.27	0.19 J	0.16 J
0.017 UJ	0.012 UJ	0.015 UJ	0.015 UJ	0.017 UJ	0.017 UJ	0.017 UJ	0.014 UJ	0.017 UJ	0.0164 UJ	0.017 U	0.017 U	0.015	0.015 U	0.017 U	0.0096	0.012 U	0.0097 U	0.009 J	0.0089 J	0.012 U
0.41 J	0.43	0.43 J	0.43 J	0.45	0.26 J	0.41 J	0.36 J	0.29 J	0.354 J	0.49 U	0.16 J	0.44 U	0.22 J	0.18 J	0.205 J	0.35 J	0.39 J	0.5	0.45	0.43 J
0.39 J	0.35 J	0.47 J	0.396 J	0.26 J	0.39 J	0.45 J	0.37 J	0.51	0.396 J	0.32 J	0.28 J	0.28 J	0.33 J	0.22 J	0.286 J	0.38	0.38 J	0.44	0.34 J	0.43 J
0.016 J	0.024 J	0.018 J	0.0512 J	0.091 U	0.091 U	0.096 U	0.085 U	0.091 U	0.0908 U	0.098 U	0.015 J	0.088 U	0.088 U	0.1 U	0.0404 J	0.072	0.021 J	0.033 J	0.04 J	0.013 J
21 J	19 J	21 J	25.4 J	18 J	14 J	17 J	25 J	23 J	19.4 J	87	3.6 U	27	3.5 U	4 U	23.91	23 J	20 J	34 J	21 J	19 J
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--	--	--	--	--	--	--	--	--	--	17 U	17 U	34 U	20 U	26 U	22.8 U	17 UJ	17 UJ	17 UJ	17 UJ	17 UJ
--	--	--	--	--	--	--	--	--	--	17 U	17 U	34 U	20 U	26 U	22.8 U	17 UJ	17 UJ	17 UJ	17 UJ	17 UJ
--	--	--	--	--	--	--	--	--	--	17 U	17 U	34 U	20 U	26 U	22.8 U	17 UJ	17 UJ	17 UJ	17 UJ	17 UJ
--	--	--	--	--	--	--	--	--	--	17 U	17 U	34 U	20 U	26 U	22.8 U	17 UJ	17 UJ	17 UJ	17 UJ	17 UJ
--	--	--	--	--	--	--	--	--	--	17 U	17 U	34 U	20 U	26 U	22.8 U	17 UJ	17 UJ	17 UJ	17 UJ	17 UJ
--	--	--	--	--	--	--	--	--	--	17 U	17 U	34 U	20 U	26 U	22.8 U	17 UJ	17 UJ	17 UJ	17 UJ	17 UJ
--	--	--	--	--	--	--	--	--	--	17 U	17 U	34 U	20 U	26 U	22.8 U	17 UJ	17 UJ	17 UJ	17 UJ	

Table 25
Results of Tissue *Macoma nasuta*

GP-DU4 M. Nasuta Clam Rep C 2/5/2013 N	GP-DU4 M. Nasuta Clam Rep D 2/5/2013 N	GP-DU4 M. Nasuta Clam Rep E 2/5/2013 N	GP-DU4 M. Nasuta Clam AVERAGE AVG	GP-DU5 M. Nasuta Clam Rep A 2/6/2013 N	GP-DU5 M. Nasuta Clam Rep B 2/6/2013 N	GP-DU5 M. Nasuta Clam Rep C 2/6/2013 N	GP-DU5 M. Nasuta Clam Rep D 2/6/2013 N	GP-DU5 M. Nasuta Clam Rep E 2/6/2013 N	GP-DU5 M. Nasuta Clam AVERAGE AVG	GP-DU6 M. Nasuta Clam Rep A 2/6/2013 N	GP-DU6 M. Nasuta Clam Rep B 2/6/2013 N	GP-DU6 M. Nasuta Clam Rep C 2/6/2013 N	GP-DU6 M. Nasuta Clam Rep D 2/6/2013 N	GP-DU6 M. Nasuta Clam Rep E 2/6/2013 N	GP-DU6 M. Nasuta Clam AVERAGE AVG	GP-DU7 M. Nasuta Clam Rep A 2/5/2013 N	GP-DU7 M. Nasuta Clam Rep B 2/5/2013 N	GP-DU7 M. Nasuta Clam Rep C 2/5/2013 N	GP-DU7 M. Nasuta Clam Rep D 2/5/2013 N	GP-DU7 M. Nasuta Clam Rep E 2/5/2013 N
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	0.21 J
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	1 U
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	18 J
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	13 J
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U	1.1 U	1 U	1 U	0.66 J

Table 25
Results of Tissue *Macoma nasuta*

GP-DU7 M. Nasuta Clam AVERAGE AVG	GP-DU8 M. Nasuta Clam Rep A 2/5/2013 N	GP-DU8 M. Nasuta Clam Rep B 2/5/2013 N	GP-DU8 M. Nasuta Clam Rep C 2/5/2013 N	GP-DU8 M. Nasuta Clam Rep D 2/5/2013 N	GP-DU8 M. Nasuta Clam Rep E 2/5/2013 N	GP-DU8 M. Nasuta Clam AVERAGE AVG	GP-DU9 M. Nasuta Clam Rep A 2/5/2013 N	GP-DU9 M. Nasuta Clam Rep B 2/5/2013 N	GP-DU9 M. Nasuta Clam Rep C 2/5/2013 N	GP-DU9 M. Nasuta Clam Rep D 2/5/2013 N	GP-DU9 M. Nasuta Clam Rep E 2/5/2013 N	GP-DU9 M. Nasuta Clam AVERAGE AVG	GP-DU10 M. Nasuta Clam Rep A 2/6/2013 N	GP-DU10 M. Nasuta Clam Rep B 2/6/2013 N	GP-DU10 M. Nasuta Clam Rep C 2/6/2013 N	GP-DU10 M. Nasuta Clam Rep D 2/6/2013 N	GP-DU10 M. Nasuta Clam Rep E 2/6/2013 N	GP-DU10 M. Nasuta Clam AVERAGE AVG
1.284	0.7	1.7	0.8	0.8	0.7	0.94	1	1.2	0.6	1	1.4	1.04	0.76	0.72	0.64	1	0.85	0.794
4.8	4.8	4.5	4.8	5.2	4.2	4.7	3.7	4.3	4.9	5.1	3.9	4.38	3.7	3.9	4.1	3.8	4.1	3.92
0.394 U	0.42 U	0.29 U	0.39 U	0.33 U	0.37 U	0.36 U	0.45 U	0.38 U	0.39 U	0.38 U	0.39 U	0.398 U	0.44 U	0.45 U	0.42 U	0.5 U	0.42 U	0.446 U
0.199 J	0.42 U	0.29 U	0.39 U	0.33 U	0.37 U	0.36 U	0.45 U	0.38 U	0.39 U	0.38 U	0.39 U	0.398 U	0.32 J	0.22 J	0.17 J	0.22 J	0.24 J	0.234 J
2.169	2.3	2	2.1	2.6	2.3	2.26	1.8	2.4	2.4	2.4	2.3	2.26	1.6	5.1	1.8	4.8	2.3	3.12
0.228 J	0.21 U	0.15 U	0.2 U	0.16 U	0.18 U	0.18 U	0.22 U	0.19 U	0.2 U	0.19 U	0.2 U	0.2 U	1.1	0.18 J	0.26	0.26	0.14 J	0.388 J
0.00695 J	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	0.014 UJ	0.016 UJ	0.017 UJ	0.016 UJ	0.015 UJ	0.0156 UJ
0.424 J	0.45	0.44	0.38 J	0.41	0.43	0.422 J	0.33 J	0.41	0.4	0.46	0.63	0.446 J	0.48	0.77	0.43	0.44 J	0.34 J	0.492 J
0.394 J	0.41 J	0.32	0.33 J	0.43	0.36 J	0.37 J	0.4 J	0.18 J	0.43	0.42	0.32 J	0.35 J	0.37 J	0.45	0.38 J	0.43 J	0.26 J	0.378 J
0.0358 J	0.083 U	0.058 U	0.078 U	0.066 U	0.074 U	0.0718 U	0.089 U	0.076 U	0.078 U	0.077 U	0.078 U	0.0796 U	0.088 U	0.089 U	0.026 J	0.041 J	0.017 J	0.0345 J
23.4 J	19	17	23	22	35	23.2	26	20	34	20	19	23.8	21 J	19	18	23	19	20 J
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17 UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.458 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.452 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 25
Results of Tissue *Macoma nasuta*

GP-DU7 M. Nasuta Clam AVERAGE AVG	GP-DU8 M. Nasuta Clam Rep A 2/5/2013 N	GP-DU8 M. Nasuta Clam Rep B 2/5/2013 N	GP-DU8 M. Nasuta Clam Rep C 2/5/2013 N	GP-DU8 M. Nasuta Clam Rep D 2/5/2013 N	GP-DU8 M. Nasuta Clam Rep E 2/5/2013 N	GP-DU8 M. Nasuta Clam AVERAGE AVG	GP-DU9 M. Nasuta Clam Rep A 2/5/2013 N	GP-DU9 M. Nasuta Clam Rep B 2/5/2013 N	GP-DU9 M. Nasuta Clam Rep C 2/5/2013 N	GP-DU9 M. Nasuta Clam Rep D 2/5/2013 N	GP-DU9 M. Nasuta Clam Rep E 2/5/2013 N	GP-DU9 M. Nasuta Clam AVERAGE AVG	GP-DU10 M. Nasuta Clam Rep A 2/6/2013 N	GP-DU10 M. Nasuta Clam Rep B 2/6/2013 N	GP-DU10 M. Nasuta Clam Rep C 2/6/2013 N	GP-DU10 M. Nasuta Clam Rep D 2/6/2013 N	GP-DU10 M. Nasuta Clam Rep E 2/6/2013 N	GP-DU10 M. Nasuta Clam AVERAGE AVG
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.452 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1.02 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4.42 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3.01 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.542 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 25
Results of Tissue *Macoma nasuta*

Notes:
Bold = Detected result
-- = results not reported or not applicable

AVG = average
FDA = Food and Drug Administration
HPAH = high molecular weight PAH
J = Estimated value
LPAH = low molecular weight PAH
mg/kg = milligrams per kilogram
N = normal sample
PAH = polyaromatic hydrocarbons
PCB = polychlorinated biphenyls
pct = percent
R = rejected
Rep = replicate
TRP = triplicate
U = Compound analyzed, but not detected above detection limit
µg/kg = micrograms per kilogram
UJ = Compound analyzed, but not detected above estimated detection limit

* Steady-state factors and FDA limits are listed in the Southeast Regional Implementation Manual (SERIM) 2008, Appendix H, Table 1.
The bivalve species used in this bioaccumulation study is *Macoma nasuta*.
The polychaete species used in this bioaccumulation study is *Nereis virens*.
All detected results presented in this table are adjusted using the steady-state factors listed above. Calculated totals that resulted in a detected value are also adjusted using the steady-state factors, if applicable.
Totals:
Totals (U=0) are calculated as the sum of all detected results (U=0). If all results are not detected, the highest reporting limit value is reported as the sum.
Totals (U=1/2) are calculated as the sum of all detected results and either half of the reporting limit or the J-flagged value (whichever is greater) if the result is below the reporting limit, in accordance with instructions in the SERIM 2008, Section 7.5.1. If all results are not detected, the highest reporting limit value is reported as the sum.
Total HPAH is the sum of benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene, and pyrene.
Total LPAH is the sum of acenaphthene, anthracene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, phenanthrene.
Total PAH is the sum of all PAHs listed in this table.
Total PCB Congeners (NOAA) is the sum of the following analytes multiplied by two: PCB-008, PCB-018, PCB-028, PCB-044, PCB-052, PCB-066, PCB-101, PCB-105, PCB-118, PCB-128, PCB-138, PCB-153, PCB-170, PCB-180, PCB-187, PCB-195, PCB-206, PCB-209
Total PCB Congeners (EPA Region 4) is the sum of all PCB congeners listed on this table.
Averages:
Replicate averages for each analyte are calculated as the sum of all detected results and half of the reporting limit of non-detected results divided by the number of replicates for each corresponding treatment.
If all results are not detected, the averages are calculated as the sum of all of the reporting limits divided by the number of replicates.

USEPA Stage 2A data validation was completed by Anchor QEA.
Results are reported in dry weight basis.
All non-detect results are reported at the **reporting limit**.

FINAL VALIDATED DATA

Table 26
Results of Tissue *Nereis virens*

FINAL VALIDATED DATA		Sample Name Sample Date Sample Type	Background Tissue N. Virens TRP A 1/7/2013 N	Background Tissue N. Virens TRP B 1/7/2013 N	Background Tissue N. Virens TRP C 1/7/2013 N	Background Tissue N. Virens AVERAGE AVG	RS-GP-C N. Virens Worm Rep A 2/6/2013 N	RS-GP-C N. Virens Worm Rep B 2/6/2013 N	RS-GP-C N. Virens Worm Rep C 2/6/2013 N	RS-GP-C N. Virens Worm Rep D 2/6/2013 N	RS-GP-C N. Virens Worm Rep E 2/6/2013 N	RS-GP-C N. Virens Worm AVERAGE AVG	RS-PAS-A N. Virens Worm Rep A 2/5/2013 N
	Steady-state factor	FDA Limits											
Conventional Parameters (pct)													
Lipids	--	--	2.2	2.5	2.1	2.3	1.5	1.9	1.1	1.5	1.5	1.5	1.6
Metals (mg/kg)													
Arsenic	1.0	76	2.8	3.7	2.8	3.1	3	2.9	3.1	2.8	2.5	2.86	2.8
Cadmium	1.0	4	0.4 U	0.46 U	0.45 U	0.44 U	0.48 U	0.31 U	0.35 U	0.48 U	0.49 U	0.422 U	0.4 U
Chromium	1.0	12	0.4 U	0.22 J	0.45 U	0.215 J	0.22 J	0.12 J	0.18 J	0.18 J	0.49 U	0.189 J	0.4 U
Copper	1.0	--	1.4	2.4	1	1.6	1.1	1.1	1.1	0.91 J	1.4	1.122 J	1.2
Lead	1.0	1.5	0.2 U	0.23	0.067 J	0.13 J	0.076 J	0.19	0.11 J	0.084 J	0.2 J	0.132 J	0.2 U
Mercury	1.0	1	0.011 J	0.012 U	0.014 U	0.008 J	0.014	0.014 U	0.016 U	0.011 UJ	0.014 UJ	0.0083	0.016 U
Nickel	1.0	70	0.14 J	0.54	0.19 J	0.29 J	0.26 J	0.22 J	0.28 J	0.19 J	0.18 J	0.226 J	0.16 J
Selenium	1.0	--	0.25 J	0.42 J	0.35 J	0.34 J	0.43 J	0.31	0.38	0.48 U	0.49 U	0.321 J	0.33 J
Silver	1.0	--	0.081 U	0.045 J	0.022 J	0.036 J	0.012 J	0.012 J	0.019 J	0.015 J	0.046 J	0.0208 J	0.011 J
Zinc	1.0	--	45	19	56	40	13	11	67	10 J	71 J	34.4 J	11
Polycyclic Aromatic Hydrocarbons (µg/kg)													
1-Methylnaphthalene	1.0	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
2-Methylnaphthalene	1.0	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Acenaphthene	1.0	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Acenaphthylene	1.0	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Anthracene	1.0	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Benzo(a)anthracene	1.7	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Benzo(a)pyrene	2.1	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Benzo(b)fluoranthene	2.3	--	17 UJ	17 U	17 U	17 UJ	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Benzo(g,h,i)perylene	2.9	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Benzo(k)fluoranthene	2.3	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Chrysene	1.4	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Dibenzo(a,h)anthracene	2	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Fluoranthene	1.1	--	17 UJ	17 U	17 U	17 UJ	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Fluorene	1.0	--	17 UJ	17 U	17 U	17 UJ	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Indeno(1,2,3-c,d)pyrene	3	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Naphthalene	1.0	--	17 U	17 U	17 U	17 U	43	110	49	62	100 U	62.8	--
Phenanthrene	1.0	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Pyrene	1.1	--	17 U	17 U	17 U	17 U	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Total HPAHs (U=1/2)	--	--	17 UJ	17 U	17 U	17 UJ	34 U	100 U	34 U	34 U	100 U	60.4 U	--
Total LPAHs (U=1/2)	--	--	17 UJ	17 U	17 U	17 UJ	145	410	151	164	100 U	184	--
Total PAHs (U=1/2)	--	--	17 UJ	17 U	17 U	17 UJ	332	960	338	351	100 U	406.2	--
Total PAHs (U = 0)	--	--	17 UJ	17 U	17 U	17 UJ	43	110	49	62	100 U	62.8	--
PCB Congeners (µg/kg)													
PCB-008	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	6.6 U
PCB-018	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	6.6 U
PCB-028	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	6.6 U
PCB-044	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	6.6 U

Table 26
Results of Tissue *Nereis virens*

FINAL VALIDATED DATA		Sample Name Sample Date Sample Type	Background Tissue N. Virens TRP A 1/7/2013 N	Background Tissue N. Virens TRP B 1/7/2013 N	Background Tissue N. Virens TRP C 1/7/2013 N	Background Tissue N. Virens AVERAGE AVG	RS-GP-C N. Virens Worm Rep A 2/6/2013 N	RS-GP-C N. Virens Worm Rep B 2/6/2013 N	RS-GP-C N. Virens Worm Rep C 2/6/2013 N	RS-GP-C N. Virens Worm Rep D 2/6/2013 N	RS-GP-C N. Virens Worm Rep E 2/6/2013 N	RS-GP-C N. Virens Worm AVERAGE AVG	RS-PAS-A N. Virens Worm Rep A 2/5/2013 N
	Steady-state factor	FDA Limits											
PCB-049	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	6.6 U
PCB-052	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	6.6 U
PCB-066	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	6.6 U
PCB-077	--	--	0.3 J	0.22 J	0.98 U	0.34 J	--	--	--	--	--	--	6.6 U
PCB-087	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	5.2 J
PCB-101	--	--	1 U	0.25 J	0.31 J	0.35 J	--	--	--	--	--	--	8.6
PCB-105	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	3.4 J
PCB-118	--	--	1 U	0.25 J	0.98 U	0.41 J	--	--	--	--	--	--	10
PCB-126	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	6.6 U
PCB-128	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	13 J
PCB-138	--	--	0.65 J	0.47 J	0.69 J	0.60 J	--	--	--	--	--	--	19
PCB-153	--	--	0.96 J	2	2	1.65 J	--	--	--	--	--	--	17
PCB-156	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	3 J
PCB-169	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	6.6 U
PCB-170	--	--	0.48 J	0.8 J	0.75 J	0.68 J	--	--	--	--	--	--	83 J
PCB-180	--	--	0.39 J	0.61 J	0.61 J	0.54 J	--	--	--	--	--	--	59
PCB-183	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	9.2
PCB-184	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	6.6 U
PCB-187	--	--	0.72 J	0.98 J	0.61 J	0.77 J	--	--	--	--	--	--	27
PCB-195	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	19
PCB-206	--	--	0.37 J	0.47 J	0.48 J	0.44 J	--	--	--	--	--	--	160
PCB-209	--	--	1 U	1 U	0.98 U	0.99 U	--	--	--	--	--	--	16
Total PCB Congeners (NOAA) (U=1/2)	--	--	19.66 J	22.78 J	22.06 J	21.5 J	--	--	--	--	--	--	909.6 J
Total PCB Congeners (EPA Region 4) (U=1/2)	1.7	2000	23.51 J	26.16 J	25.41 J	25.03 J	--	--	--	--	--	--	831.3 J
Total PCB Congener (EPA Region 4) (U = 0)	--	--	3.87 J	6.05 J	5.45 J	5.12 J	--	--	--	--	--	--	452.4 J

Table 26
Results of Tissue *Nereis virens*

RS-PAS-A N. Virens Worm Rep B 2/5/2013 N	RS-PAS-A N. Virens Worm Rep C 2/5/2013 N	RS-PAS-A N. Virens Worm Rep D 2/5/2013 N	RS-PAS-A N. Virens Worm Rep E 2/5/2013 N	RS-PAS-A N. Virens Worm AVERAGE AVG	GP-DU1 N. Virens Worm Rep A 2/5/2013 N	GP-DU1 N. Virens Worm Rep B 2/5/2013 N	GP-DU1 N. Virens Worm Rep C 2/5/2013 N	GP-DU1 N. Virens Worm Rep D 2/5/2013 N	GP-DU1 N. Virens Worm Rep E 2/5/2013 N	GP-DU1 N. Virens Worm AVERAGE AVG	GP-DU2 N. Virens Worm Rep A 2/6/2013 N	GP-DU2 N. Virens Worm Rep B 2/6/2013 N	GP-DU2 N. Virens Worm Rep C 2/6/2013 N	GP-DU2 N. Virens Worm Rep D 2/6/2013 N	GP-DU2 N. Virens Worm Rep E 2/6/2013 N
1.8	2.2	1.3	1.9	1.76	1.9	4.6	7.3	2.9	2.2	3.78	1.1	1.4	1.7	1.2	1.2
2.9	3	2.7	3.5	2.98	2.5	2.4	2.6	2.3	2.8	2.52	2.6	2.4	2.3	2.7	3
0.49 U	0.46 U	0.42 U	0.46 U	0.446 U	0.47 U	0.42 U	0.34 U	0.32 U	0.47 U	0.404 U	0.42 U	0.44 U	0.34 U	0.39 U	0.4 U
0.49 U	0.46 U	0.42 U	0.46 U	0.446 U	0.47 U	0.42 U	0.13 J	0.12 J	0.47 U	0.186 J	0.27 J	0.44 U	0.22 J	0.19 J	0.18 J
0.84 J	1	1.8	1	1.168 J	0.94 U	0.83 U	0.68 U	1.3	1.3	0.765	1.4	1	0.79	0.95	0.96
0.25 U	0.23 U	0.21 U	0.23 U	0.224 U	0.24 U	0.21 U	0.082 J	0.11 J	0.17 J	0.1174 J	0.55	0.12 J	0.058 J	0.083 J	0.081 J
0.014 U	0.015 U	0.0092 J	0.013 U	0.00764 J	0.012 U	0.013 U	0.013 U	0.013 UJ	0.016 UJ	0.0134 UJ	0.016 UJ	0.016 UJ	0.011 UJ	0.015 UJ	0.016 UJ
0.49 U	0.46 U	0.16 J	0.46 U	0.205 J	0.47 U	0.42 U	0.12 J	0.35	0.16 J	0.215 J	0.42 U	0.44 U	0.21 J	0.18 J	0.2 J
0.37 J	0.33 J	0.42 U	0.34 J	0.316 J	0.4 J	0.28 J	0.35	0.25 J	0.31 J	0.318 J	0.42 U	0.44 U	0.34 U	0.39 U	0.4 U
0.098 U	0.024 J	0.021 J	0.018 J	0.0246 J	0.013 J	0.019 J	0.025 J	0.013 J	0.026 J	0.0192 J	0.017 J	0.031 J	0.01 J	0.13	0.012 J
12	12	13	12	12	11 J	57 J	13 J	55 J	13 J	29.8 J	13 J	39 J	14 J	10 J	55 J
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 UJ	17 UJ	17 UJ
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 UJ	17 UJ	17 UJ
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 UJ	17 UJ	17 UJ
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 U	17 U	17 U
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 UJ	17 UJ	17 UJ
--	--	--	--	--	--	--	--	--	--	--	17 U	17 U	17 UJ	17 UJ	17 UJ
1.1 U	0.94 U	20 U	1.1 U	5.948 U	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	20 U	1.1 U	5.948 U	--	--	--	--	--	--	--	--	--	--	--
0.75 J	0.48 J	20 U	0.87 J	3.08 J	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	4.7 J	1.1 U	1.914 J	--	--	--	--	--	--	--	--	--	--	--

Table 26
Results of Tissue *Nereis virens*

RS-PAS-A N. Virens Worm Rep B 2/5/2013 N	RS-PAS-A N. Virens Worm Rep C 2/5/2013 N	RS-PAS-A N. Virens Worm Rep D 2/5/2013 N	RS-PAS-A N. Virens Worm Rep E 2/5/2013 N	RS-PAS-A N. Virens Worm AVERAGE AVG	GP-DU1 N. Virens Worm Rep A 2/5/2013 N	GP-DU1 N. Virens Worm Rep B 2/5/2013 N	GP-DU1 N. Virens Worm Rep C 2/5/2013 N	GP-DU1 N. Virens Worm Rep D 2/5/2013 N	GP-DU1 N. Virens Worm Rep E 2/5/2013 N	GP-DU1 N. Virens Worm AVERAGE AVG	GP-DU2 N. Virens Worm Rep A 2/6/2013 N	GP-DU2 N. Virens Worm Rep B 2/6/2013 N	GP-DU2 N. Virens Worm Rep C 2/6/2013 N	GP-DU2 N. Virens Worm Rep D 2/6/2013 N	GP-DU2 N. Virens Worm Rep E 2/6/2013 N
1.1 U	0.94 U	20 U	1.1 U	5.948 U	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	20 U	0.33 J	2.93 J	--	--	--	--	--	--	--	--	--	--	--
0.67 J	0.94 U	7.4 J	0.8 J	2.528 J	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	97 J	1.1 U	20.37 J	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	25	1.1 U	6.354 J	--	--	--	--	--	--	--	--	--	--	--
1 J	0.33 J	49	1.1 U	11.90 J	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	24	1.1 U	5.794 J	--	--	--	--	--	--	--	--	--	--	--
0.75 J	0.52 J	34	0.32 J	9.118 J	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	20 U	1.1 U	5.948 U	--	--	--	--	--	--	--	--	--	--	--
0.46 J	0.94 U	100 J	1.1 U	22.90 J	--	--	--	--	--	--	--	--	--	--	--
1.7	0.98	96	0.65 J	23.67 J	--	--	--	--	--	--	--	--	--	--	--
3.2	2.2	110	2.8	27.04	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	20 U	1.1 U	2.914 J	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	20 U	1.1 U	5.948 U	--	--	--	--	--	--	--	--	--	--	--
1.6	0.99	390 J	1.1 J	95.34 J	--	--	--	--	--	--	--	--	--	--	--
1.4	0.75 J	340	0.96 J	80.42 J	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	77	0.43 J	17.53 J	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	20 U	1.1 U	5.948 U	--	--	--	--	--	--	--	--	--	--	--
1.5	0.93 J	260	1 J	58.09 J	--	--	--	--	--	--	--	--	--	--	--
1.1 U	0.94 U	67	1.1 U	17.51	--	--	--	--	--	--	--	--	--	--	--
0.64 J	0.81 J	480	0.32 J	128.4 J	--	--	--	--	--	--	--	--	--	--	--
0.38 J	0.94 U	44	1.1 U	12.28 J	--	--	--	--	--	--	--	--	--	--	--
35.22 J	24.72 J	4108 J	28.46 J	1021 J	--	--	--	--	--	--	--	--	--	--	--
37.41 J	27.40 J	3915 J	31.67 J	968.6 J	--	--	--	--	--	--	--	--	--	--	--
14.05 J	7.99 J	2205 J	9.58 J	537.8 J	--	--	--	--	--	--	--	--	--	--	--

Table 26
Results of Tissue *Nereis virens*

GP-DU2 N. Virens Worm AVERAGE AVG	GP-DU3 N. Virens Worm Rep A 2/6/2013 N	GP-DU3 N. Virens Worm Rep B 2/6/2013 N	GP-DU3 N. Virens Worm Rep C 2/6/2013 N	GP-DU3 N. Virens Worm Rep D 2/6/2013 N	GP-DU3 N. Virens Worm Rep E 2/6/2013 N	GP-DU3 N. Virens Worm AVERAGE AVG	GP-DU4 N. Virens Worm Rep A 2/5/2013 N	GP-DU4 N. Virens Worm Rep B 2/5/2013 N	GP-DU4 N. Virens Worm Rep C 2/5/2013 N	GP-DU4 N. Virens Worm Rep D 2/5/2013 N	GP-DU4 N. Virens Worm Rep E 2/5/2013 N	GP-DU4 N. Virens Worm AVERAGE AVG	GP-DU5 N. Virens Worm Rep A 2/6/2013 N	GP-DU5 N. Virens Worm Rep B 2/6/2013 N	GP-DU5 N. Virens Worm Rep C 2/6/2013 N
1.32	0.95	1.4	0.83	1.6	1	1.156	1.6	1.8	1.4	1.5	1.8	1.62	1.1	1.3	1.7
2.6	2.5	3	2.8	2.3	2.3	2.58	2.3	2.5	2.3	2.6	2.7	2.48	2.3	1.8	2.1
0.398 U	0.43 U	0.48 U	0.42 U	0.48 U	0.5 U	0.462 U	0.43 U	0.47 U	0.39 U	0.3 U	0.49 U	0.416 U	0.45 U	0.44 U	0.47 U
0.216 J	0.43 U	0.48 U	0.42 U	0.48 U	0.5 U	0.462 U	0.43 U	0.47 U	0.39 U	0.3 U	0.49 U	0.416 U	0.45 U	0.44 U	0.47 U
1.02	0.93	1	1	1.3	1.4	1.126	1.3	1.3	1.4	1.2	1.1	1.26	0.98	1	1.2
0.1784 J	0.082 J	0.24 U	0.21 U	0.14 J	0.19 J	0.1274 J	0.065 J	0.24 U	0.062 J	0.082 J	0.075 J	0.0808 J	0.075 J	0.081 J	0.24 U
0.0148 UJ	0.011 UJ	0.015 UJ	0.013 UJ	0.016 UJ	0.012 J	0.0079 J	0.017 UJ	0.014 UJ	0.017 UJ	0.016 UJ	0.015 UJ	0.0158 UJ	0.016 UJ	0.017 UJ	0.016 UJ
0.204 J	0.14 J	0.18 J	0.23 J	0.16 J	0.19 J	0.18 J	0.43 U	0.47 U	0.39 U	0.3 U	0.49 U	0.416 U	0.16 J	0.44 U	0.47 U
0.398 U	0.43 U	0.48 U	0.42 U	0.21 J	0.19 J	0.213 J	0.42 J	0.21 J	0.35 J	0.35	0.4 J	0.346 J	0.25 J	0.3 J	0.24 J
0.04 J	0.017 J	0.019 J	0.012 J	0.096 U	0.1 U	0.0292 J	0.016 J	0.017 J	0.021 J	0.014 J	0.0098 J	0.01556 J	0.089 U	0.088 U	0.094 U
26.2 J	11 J	13 J	10 J	9.9 J	9.6 J	10.7 J	16 J	12 J	16 J	12 J	12 J	13.6 J	7.8 J	7.2 J	10 J
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 UJ	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 U	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 UJ	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 UJ	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 UJ	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 UJ	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 UJ	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
17 UJ	17 U	17 U	17 U	17 U	17 U	17 U	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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Table 26
Results of Tissue *Nereis virens*

[illegible]

Table 26
Results of Tissue *Nereis virens*

GP-DU5 N. Virens Worm Rep D 2/6/2013 N	GP-DU5 N. Virens Worm Rep E 2/6/2013 N	GP-DU5 N. Virens Worm AVERAGE AVG	GP-DU6 N. Virens Worm Rep A 2/6/2013 N	GP-DU6 N. Virens Worm Rep B 2/6/2013 N	GP-DU6 N. Virens Worm Rep C 2/6/2013 N	GP-DU6 N. Virens Worm Rep D 2/6/2013 N	GP-DU6 N. Virens Worm Rep E 2/6/2013 N	GP-DU6 N. Virens Worm AVERAGE AVG	GP-DU7 N. Virens Worm Rep A 2/5/2013 N	GP-DU7 N. Virens Worm Rep B 2/5/2013 N	GP-DU7 N. Virens Worm Rep C 2/5/2013 N	GP-DU7 N. Virens Worm Rep D 2/5/2013 N	GP-DU7 N. Virens Worm Rep E 2/5/2013 N	GP-DU7 N. Virens Worm AVERAGE AVG	GP-DU8 N. Virens Worm Rep A 2/5/2013 N
1.1	2.3	1.5	0.85	0.9	0.78	0.78	0.58	0.778	1.2	2	1.3	1.7	3.7	1.98	3.5
1.8	2.3	2.06	3.4	4	4.4	4.8	4.3	4.18	3	2.3	3	2.5	2.6	2.68	2.6
0.5 U	0.5 U	0.472 U	0.43 U	0.44 U	0.5 U	0.49 U	0.44 U	0.46 U	0.42 U	0.47 U	0.47 U	0.44 U	0.47 U	0.454 U	0.46 U
0.19 J	0.19 J	0.212 J	0.19 J	0.19 J	0.5 U	0.22 J	0.44 U	0.214 J	0.42 U	0.47 U	0.21 J	0.44 U	0.47 U	0.222 J	0.46 U
4.9	2.2	2.056	2.4	2.2	2.6	1.9	7.1	3.24	0.85 U	0.94 U	0.94 U	0.88 U	0.94 U	0.91 U	1.2
1.6	0.17 J	0.4092 J	0.15 J	0.16 J	0.16 J	0.14 J	0.25	0.172 J	0.066 J	0.24 U	0.076 J	0.22 U	0.079 J	0.0902 J	0.23 U
0.017 UJ	0.016 UJ	0.0164 UJ	0.017 U	0.017 U	0.015 U	0.014 U	0.017 U	0.016 U	0.011 U	0.012 U	0.026	0.02	0.016	0.0147	-- R
0.45 J	0.19 J	0.251 J	0.28 J	0.49	0.24 J	0.48 J	1.6	0.618 J	0.21 J	0.25 J	0.25 J	0.14 J	0.15 J	0.2 J	0.17 J
0.35 J	0.3 J	0.288 J	0.54	0.46	0.43 J	0.32 J	0.32 J	0.414 J	0.37 J	0.28 J	0.35 J	0.22 J	0.4 J	0.324 J	0.3 J
0.1 U	0.1 U	0.0942 U	0.01 J	0.019 J	0.1 U	0.098 U	0.029 J	0.0314 J	0.0094 J	0.094 U	0.016 J	0.029 J	0.025 J	0.02528 J	0.093 U
7.8 J	11 J	8.76 J	3.4 U	20	22	22	3.5 U	13.49	12 J	15 J	34 J	14 J	51 J	25.2 J	12
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 U	26 U	17 U	17 U	34 U	22.2 U	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 U	26 U	17 U	17 U	34 U	22.2 U	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 U	26 U	17 U	17 U	34 U	22.2 U	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 U	26 U	17 U	17 U	34 U	22.2 U	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 U	26 U	17 U	17 U	34 U	22.2 U	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 U	26 U	17 U	17 U	34 U	22.2 U	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 U	26 U	17 U	17 U	34 U	22.2 U	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 UJ	26 UJ	17 UJ	17 UJ	34 UJ	22.2 UJ	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 UJ	26 UJ	17 UJ	17 UJ	34 UJ	22.2 UJ	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 U	26 U	17 U	17 U	34 U	22.2 U	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 U	26 U	17 U	17 U	34 U	22.2 U	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 U	26 U	17 U	17 U	34 U	22.2 U	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 UJ	26 UJ	17 UJ	17 UJ	34 UJ	22.2 UJ	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 UJ	26 UJ	17 UJ	17 UJ	34 UJ	22.2 UJ	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 UJ	26 UJ	17 UJ	17 UJ	34 UJ	22.2 UJ	--
--	--	--	17 U	17 U	17 U	17 U	17 U	17 U	17 UJ	26 UJ	17 UJ	17 UJ	34 UJ	22.2 UJ	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	0.66 J	0.91 J	1.314 J	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--

Table 26
Results of Tissue *Nereis virens*

GP-DU5 N. Virens Worm Rep D 2/6/2013 N	GP-DU5 N. Virens Worm Rep E 2/6/2013 N	GP-DU5 N. Virens Worm AVERAGE AVG	GP-DU6 N. Virens Worm Rep A 2/6/2013 N	GP-DU6 N. Virens Worm Rep B 2/6/2013 N	GP-DU6 N. Virens Worm Rep C 2/6/2013 N	GP-DU6 N. Virens Worm Rep D 2/6/2013 N	GP-DU6 N. Virens Worm Rep E 2/6/2013 N	GP-DU6 N. Virens Worm AVERAGE AVG	GP-DU7 N. Virens Worm Rep A 2/5/2013 N	GP-DU7 N. Virens Worm Rep B 2/5/2013 N	GP-DU7 N. Virens Worm Rep C 2/5/2013 N	GP-DU7 N. Virens Worm Rep D 2/5/2013 N	GP-DU7 N. Virens Worm Rep E 2/5/2013 N	GP-DU7 N. Virens Worm AVERAGE AVG	GP-DU8 N. Virens Worm Rep A 2/5/2013 N
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	0.94 J	3.8 U	1.568 J	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	0.49 J	3.8 U	1.478 J	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	1 J	3.8 U	1.58 J	--
--	--	--	--	--	--	--	--	--	1.2 J	2.5 U	5 U	1.4 J	1.6 J	1.59 J	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	1.1 J	0.64 J	5 U	0.75 J	3.8 U	1.378 J	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	0.69 J	3.8 U	1.518 J	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	0.75 J	3.8 U	1.53 J	--
--	--	--	--	--	--	--	--	--	2.5 U	2.5 U	5 U	2.3 U	3.8 U	3.22 U	--
--	--	--	--	--	--	--	--	--	45 J	45 J	10 U	41.9 J	68.4 J	41.06 J	--
--	--	--	--	--	--	--	--	--	55.25 J	55.25 J	5 U	51.25 J	83.98 J	49.64 J	--
--	--	--	--	--	--	--	--	--	2.3 J	0.64 J	5 U	6.68 J	2.51 J	2.926 J	--

Table 26
Results of Tissue *Nereis virens*

[illegible]

Table 26
Results of Tissue *Nereis virens*

[illegible]

Table 26
Results of Tissue *Nereis virens*

Notes:

95 percent upper confidence limit is greater than FDA Limits

Bold = Detected result

-- = results not reported or not applicable

- AVG = average
FDA = Food and Drug Administration
HPAH = high molecular weight PAH
J = Estimated value
LPAH = low molecular weight PAH
mg/kg = milligrams per kilogram
N = normal sample
PAH = polyaromatic hydrocarbons
PCB = polychlorinated biphenyls
pct = percent
R = rejected
Rep = replicate
TRP = triplicate
U = Compound analyzed, but not detected above detection limit
µg/kg = micrograms per kilogram
UJ = Compound analyzed, but not detected above estimated detection limit

* Steady-state factors and FDA limits are listed in the Southeast Regional Implementation Manual (SERIM) 2008, Appendix H, Table 1.

The bivalve species used in this bioaccumulation study is *Macoma nasuta*.

The polychaete species used in this bioaccumulation study is *Nereis virens*.

All detected results presented in this table are adjusted using the steady-state factors listed above. Calculated totals that resulted in a detected value are also adjusted using the steady-state factors, if applicable.

Totals:

Totals (U=0) are calculated as the sum of all detected results (U=0). If all results are not detected, the highest reporting limit value is reported as the sum.

Totals (U=1/2) are calculated as the sum of all detected results and half of the reporting limit of non-detected results or the J-flagged value, whichever is greater, in accordance with instructions in the SERIM 2008, Section 7.5.1.

Total HPAH is the sum of benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene, and pyrene.

Total LPAH is the sum of acenaphthene, anthracene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, phenanthrene.

Total PAH is the sum of all PAHs listed in this table.

Total PCB Congeners (NOAA) is the sum of the following analytes multiplied by two: PCB-008, PCB-018, PCB-028, PCB-044, PCB-052, PCB-066, PCB-101, PCB-105, PCB-118, PCB-128, PCB-138, PCB-153, PCB-170, PCB-180, PCB-187, PCB-195, PCB-206, PCB-209

Total PCB Congeners (EPA Region 4) is the sum of all PCB congeners listed on this table.

Averages:

Replicate averages for each analyte are calculated as the sum of all detected results and half of the reporting limit of non-detected results divided by the number of replicates for each corresponding treatment.

If all results are not detected, the averages are calculated as the sum of all of the reporting limits divided by the number of replicates.

USEPA Stage 2A data validation was completed by Anchor QEA.

Results are reported in dry weight basis.

All non-detect results are reported at the **reporting limit**.

FINAL VALIDATED DATA

Table 27
Summary of Statistically Elevated *M. nasuta* Tissue Residue

Sample Area	Analyte	Units	Reporting Limits ¹	Background Tissue Concentration (Average)	Reference Mean Tissue Concentration ²	Project Area Mean Tissue Concentration ³	p value	Project Area Mean: Reference Mean Ratio	Comparison to Relevant Environmental Residue-Effects Database Values
GP-DU1	Arsenic	mg/kg	0.46	3.5	4.44	4.68	0.999	1.05	No statistical difference; no comparison needed
	Copper	mg/kg	0.93	2.13	2.24	2.32	1.0	1.04	No statistical difference; no comparison needed
	Mercury	mg/kg	0.016	0.014 UJ	0.00696 J	0.01108 J	0.07	1.59	No statistical difference; no comparison needed
	Silver	mg/kg	0.093	0.031 J	0.02278 J	0.0298 J	0.15	1.31	No statistical difference; no comparison needed
GP-DU2	Silver	mg/kg	0.094	0.031 J	0.02278 J	0.0314 J	0.15	1.38	No statistical difference; no comparison needed
GP-DU3	Silver	mg/kg	0.094	0.031 J	0.02278 J	0.0296 J	0.15	1.30	No statistical difference; no comparison needed
	Zinc	mg/kg	3.8	56.67	22.2	24 J	0.928	1.08	No statistical difference; no comparison needed
GP-DU4	Silver	mg/kg	0.1	0.031 J	0.02278 J	0.0512 J	0.15	2.25	No statistical difference; no comparison needed
	Zinc	mg/kg	4.2	56.67	22.2	25.4 J	0.928	1.14	No statistical difference; no comparison needed
GP-DU5	Chromium	mg/kg	0.48	0.23 J	0.242 J	0.287 J	0.886	1.19	No statistical difference; no comparison needed
	Copper	mg/kg	0.96	2.13	2.24	2.32	0.999	1.04	No statistical difference; no comparison needed
GP-DU6	Mercury	mg/kg	0.017	0.014 UJ	0.00696 J	0.0096	0.07	1.38	No statistical difference; no comparison needed
	Total LPAHs	mg/kg	NA	17 UJ	21.1	23.3	0.316	1.10	No statistical difference; no comparison needed
	Total PAHs	mg/kg	NA	17 UJ	39.9	42	0.316	1.05	No statistical difference; no comparison needed
GP-DU8	Chromium	mg/kg	0.46	0.23 J	0.242 J	0.36 U	0.121	1.49	No statistical difference; no comparison needed
	Copper	mg/kg	0.93	2.13	2.24	2.26	1.0	1.01	No statistical difference; no comparison needed
GP-DU9	Copper	mg/kg	0.93	2.13	2.24	2.26	1.0	1.01	No statistical difference; no comparison needed
GP-DU10	Copper	mg/kg	1	2.13	2.24	3.12	1.0	1.39	No statistical difference; no comparison needed
	Lead	mg/kg	0.25	0.16 J	0.284	0.388 J	1.0	1.37	No statistical difference; no comparison needed

Notes:

- 1 RLs varied across the replicates; the maximum RL was included in the table.
- 2 The reference with the lower contaminant concentrations was used for statistical comparisons (i.e., RS-GP-C).
- 3 All analytes except arsenic were log-transformed prior to statistical analysis; arsenic data were normally distributed.
- NA = Not Available

Table 28
Summary of Statistically Elevated *N. virens* Tissue Residue

Sample Area	Analyte	Units	Reporting Limits ¹	Background Tissue Concentration (Average)	Reference Mean Tissue Concentration ²	Project Area Mean Tissue Concentration ³	p value	Project Area Mean: Reference Mean Ratio	Comparison to Relevant Environmental Residue-Effects Database Values
GP-DU1	Nickel	mg/kg	0.5	0.29 J	0.205 J	0.215 J	0.09	1.05	No statistical difference; no comparison needed
	Selenium	mg/kg	0.5	0.34 J	0.316 J	0.318 J	1.0	1.01	No statistical difference; no comparison needed
	Zinc	mg/kg	4	40	12	29.8 J	0.715	2.48	No statistical difference; no comparison needed
GP-DU2	Chromium	mg/kg	0.5	0.215 J	0.189 J	0.216 J	0.767	1.14	No statistical difference; no comparison needed
	Lead	mg/kg	0.25	0.13 J	0.132 J	0.1784 J	0.147	1.35	No statistical difference; no comparison needed
	Zinc	mg/kg	4	40	12	26.2 J	0.728	2.18	No statistical difference; no comparison needed
GP-DU3	Copper	mg/kg	1	1.6	1.122 J	1.126	1.0	1.00	No statistical difference; no comparison needed
GP-DU4	Copper	mg/kg	1	1.6	1.122 J	1.26	0.778	1.12	No statistical difference; no comparison needed
	Selenium	mg/kg	0.5	0.34 J	0.316 J	0.346 J	0.992	1.09	No statistical difference; no comparison needed
	Zinc	mg/kg	4	40	12	13.6 J	0.921	1.13	No statistical difference; no comparison needed
GP-DU5	Chromium	mg/kg	0.5	0.215 J	0.189 J	0.212 J	0.767	1.12	No statistical difference; no comparison needed
	Copper	mg/kg	1	1.6	1.122 J	2.056	0.998	1.83	No statistical difference; no comparison needed
	Lead	mg/kg	0.25	0.13 J	0.132 J	0.4092 J	0.147	3.10	No statistical difference; no comparison needed
	Nickel	mg/kg	0.5	0.29 J	0.205 J	0.251 J	0.086	1.22	No statistical difference; no comparison needed
GP-DU6	Arsenic	mg/kg	0.5	3.1	3.4	4.18	0.31	1.23	No statistical difference; no comparison needed
	Chromium	mg/kg	0.5	0.215 J	0.189 J	0.214 J	0.767	1.13	No statistical difference; no comparison needed
	Copper	mg/kg	1	1.6	1.122 J	3.24	0.088	2.89	No statistical difference; no comparison needed
	Lead	mg/kg	0.25	0.13 J	0.132 J	0.172 J	0.147	1.30	No statistical difference; no comparison needed
	Nickel	mg/kg	0.5	0.29 J	0.205 J	0.618 J	0.086	3.01	No statistical difference; no comparison needed
	Zinc	mg/kg	4	40	12	13.49	1.0	1.12	No statistical difference; no comparison needed
GP-DU7	Chromium	mg/kg	0.49	0.215 J	0.189 J	0.222 J	0.767	1.17	No statistical difference; no comparison needed
	Mercury	mg/kg	0.16	0.008 J	0.00764 J	0.0147	0.423	1.92	No statistical difference; no comparison needed
	Zinc	mg/kg	3.9	40	12	25.2 J	0.264	2.10	No statistical difference; no comparison needed
GP-DU8	Copper	mg/kg	0.98	1.6	1.122 J	1.24	0.525	1.11	No statistical difference; no comparison needed
GP-DU9	Mercury	mg/kg	0.016	0.008 J	0.00764 J	0.009 J	0.423	1.18	No statistical difference; no comparison needed
	Zinc	mg/kg	3.9	40	12	42.8 J	0.954	3.57	No statistical difference; no comparison needed
GP-DU10	Copper	mg/kg	0.98	1.6	1.122 J	1.4	0.708	1.25	No statistical difference; no comparison needed
	Nickel	mg/kg	0.49	0.29 J	0.205 J	0.2475 J	0.086	1.21	No statistical difference; no comparison needed

Notes:

1 RLs varied across replicates; the maximum RL was included in the table.

2 The reference with the lower contaminant concentrations was used in the statistical comparison. RS-GP-C was used for arsenic, cadmium, chromium, copper, and lead; RS-PAS-A was used for mercury, nickel, selenium, and zinc.

3 All analytes except selenium were log-transformed prior to statistical analysis; Selenium was normally distributed.

Table 29

Ocean Disposal Suitability Determinations for Gulfport Turning Basin Dredge Units

Dredge Unit	LPC Requirement Met?					Recommended for Ocean Disposal
	Tier II		Tier III			
	<i>Chemical Analyses</i>		<i>Biological Tests and Chemical Analyses</i>			
	Site Water	Elutriate	SP	SPP	Bioaccumulation	
GP-DU1	Yes	Yes	Yes	Yes	Yes	Yes
GP-DU2	Yes	Yes	Yes	Yes	Yes	Yes
GP-DU3	Yes	Yes	Yes	Yes	Yes	Yes
GP-DU4	Yes	Yes	Yes	Yes	Yes	Yes
GP-DU5	Yes	No (copper > WQC) ¹	Yes	Yes	Yes	Yes
GP-DU6	Yes	Yes	Yes	Yes	Yes	Yes
GP-DU7	Yes	Yes	Yes	Yes	Yes	Yes
GP-DU8	Yes	Yes	Yes	Yes	Yes	Yes
GP-DU9	Yes	Yes	Yes	Yes	Yes	Yes
GP-DU10	Yes	Yes	Yes	Yes	Yes	Yes

Notes:

1 STFATE modeling indicated copper was elevated 2.3 times above the WQC. However, further modeling conducted for the SPP tests showed no WQC exceedance after 4 hours or outside the disposal area. Therefore, Tier III results supersede these initial findings from Tier II modeling.

FIGURES

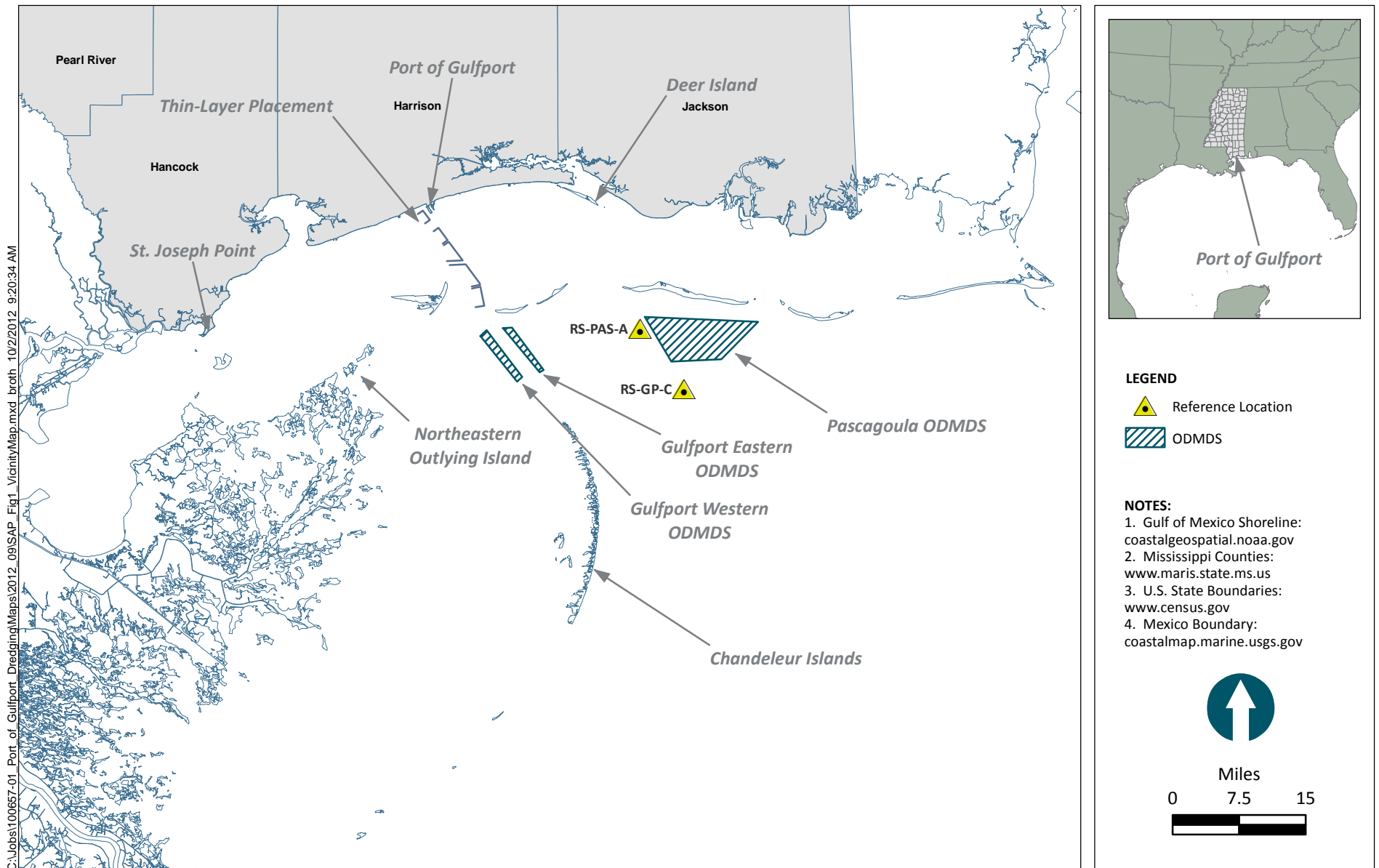
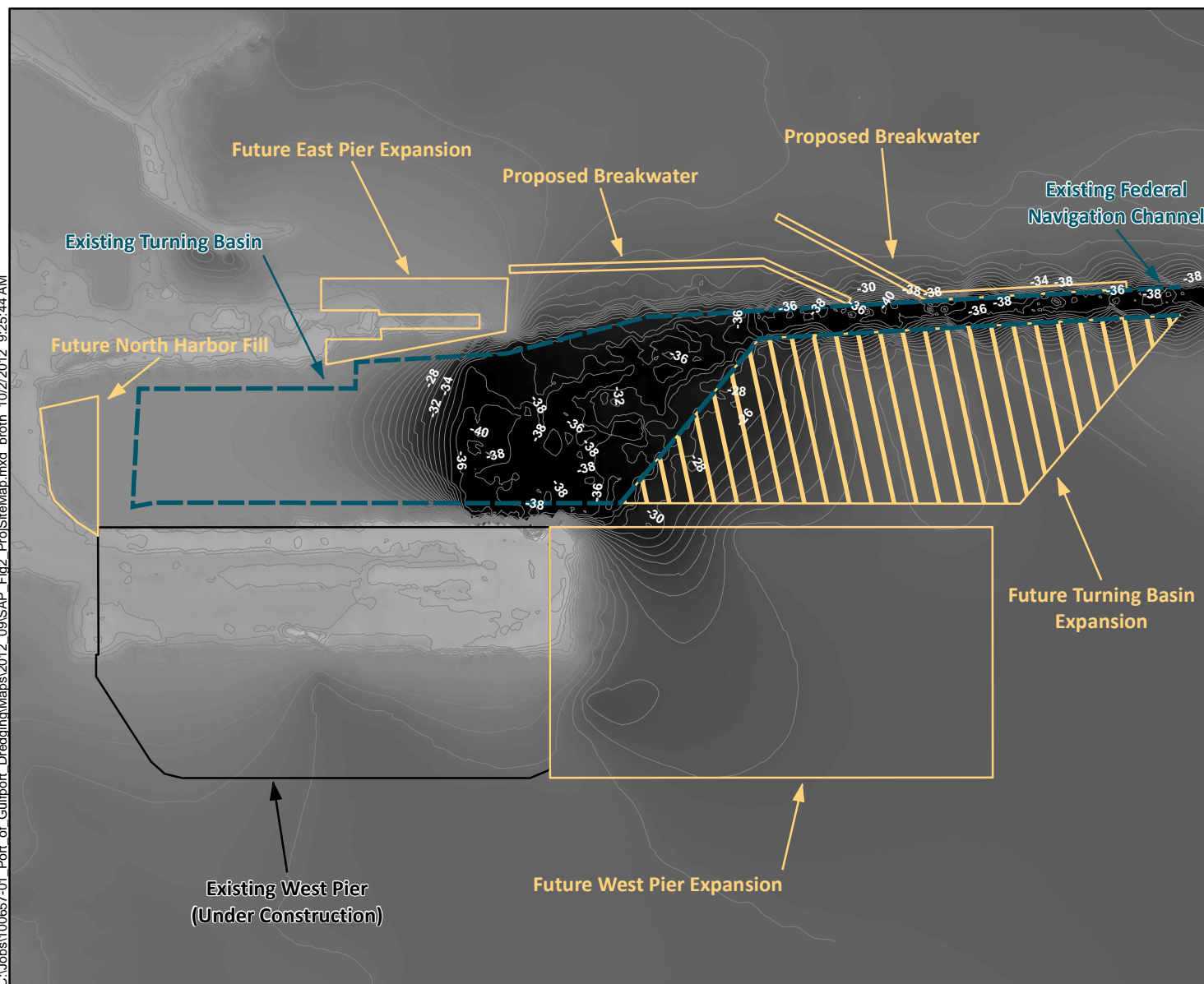


Figure 1
Vicinity Map
Sampling and Analysis Plan for Dredged Material Evaluation: Gulfport Turning Basin Expansion
Mississippi State Port Authority - Port of Gulfport

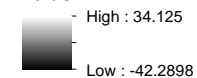
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LEGEND

NOAA Digital Elevation Model

Value



NOTES:

1. Gulf of Mexico Shoreline: coastalgeospatial.noaa.gov
2. Mississippi Counties: www.maris.state.ms.us
3. Digital Elevation Model: NOAA 2008
4. Expansion Alignment: CH2M HILL 2011



Feet

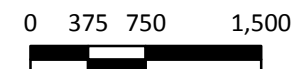
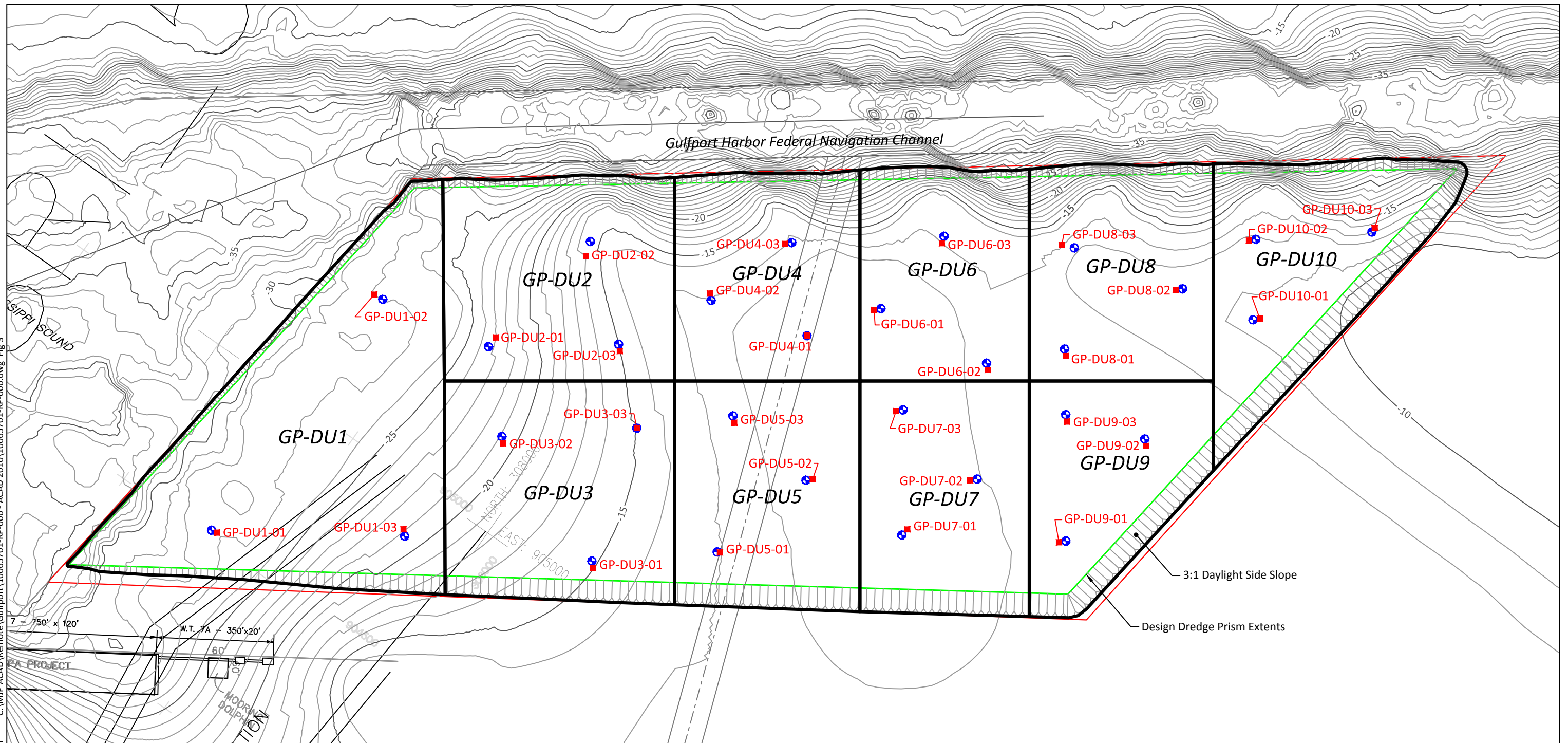


Figure 2
Project Site Map
Sampling and Analysis Plan for Dredged Material Evaluation: Gulfport Turning Basin Expansion
Mississippi State Port Authority - Port of Gulfport

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APPENDICES A, B, C, D, E, AND F
(SEE ATTACHED CD)
